MARCH, 1929

Annual Labor Saving Number

Railway Engineering and Maintenance

Less Than ONE-HALF Cent

Do you know that due to the extreme simplicity of the Fair Rail Anti-Creeper, it can be applied with the ordinary spike maul at a cost of less than one-half cent?

This is a factor which should not be overlooked in recommending or purchasing rail anti-creepers.

New York Montreal Calcutta THE P. & M. CO. London Paris Sydney
Chicago

Cost Less to Apply

FIRST, because of the low initial cost of HY-CROME. Scientific manufacturing facilities enable us to give to the railroads *"the most of the best for the least."*

Second, because there is no breakage loss during application—HY-CROME Spring Washers are made from electric alloy steel—the toughest, most dependable grade manufactured.

Third, because the non-breakable and non-fatiguing qualities of HY-CROME insure permanent rail joint security, thus reducing to minimum depreciation costs.

No attention is needed after application—the wide reactive range of HY-CROME compensates for all wear and maintains proper bolt tension under every operating condition.

The Reliance Manufacturing Co.
Massillon, Ohio

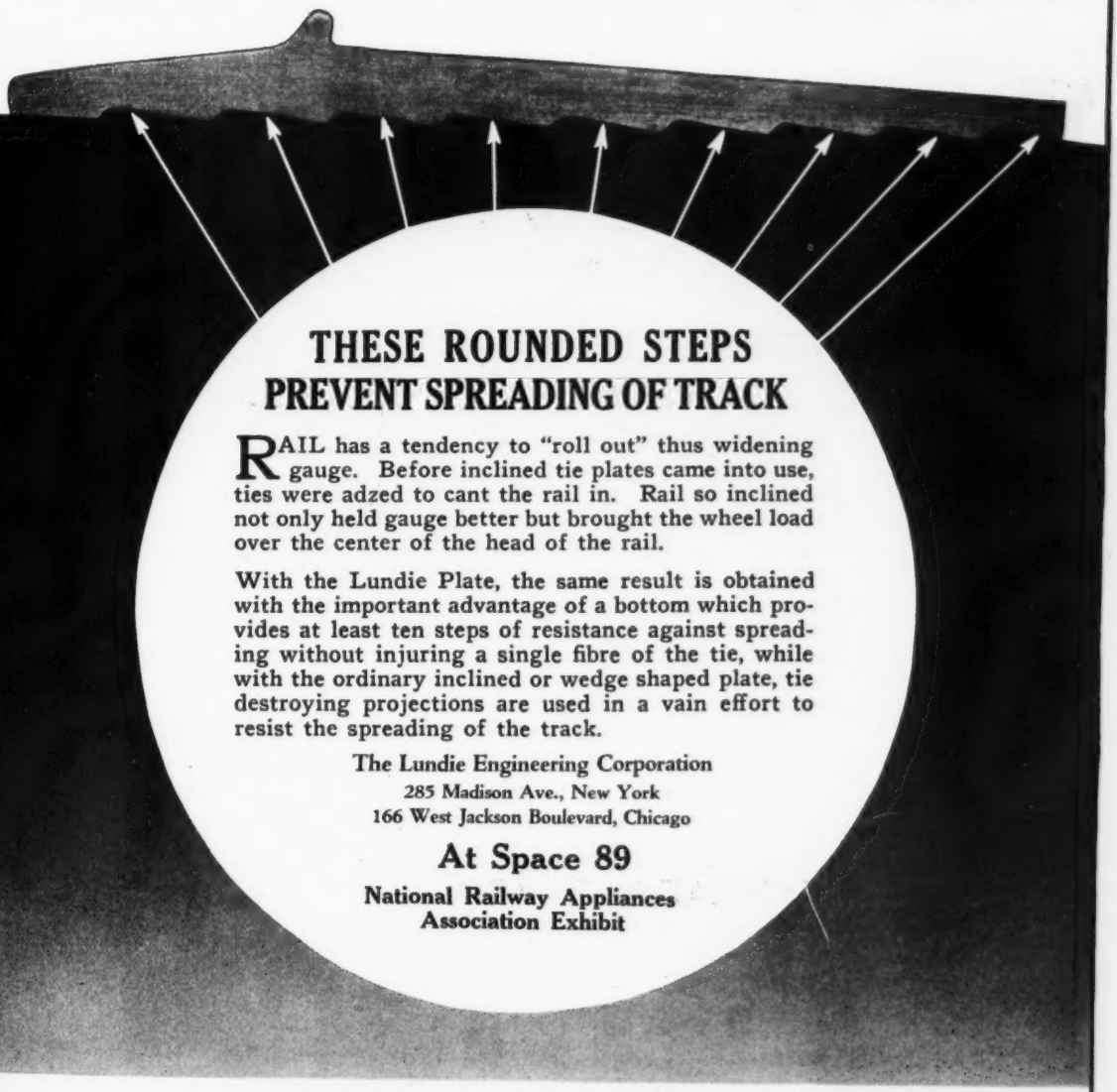
HY-CROME

"The Most of the Best for the Least"

RAILWAY ENGINEERING AND MAINTENANCE
Published monthly by Simmons-Boardman Publishing Co., at 105 W. Adams St., Chicago. Subscription price: United States, Canada and Mexico, $2.00; foreign countries, $3.00 a year. Single copy, 35 cents. Entered as second class matter January 13, 1916, at the postoffice at Chicago, Illinois, under the act of March 3, 1879

Alphabetical Index to Advertisers, Page 92 Classified Index to Advertisers, 88-90

This Canted Bottom Tie Plate Holds Track to Perfect Gauge



THESE ROUNDED STEPS PREVENT SPREADING OF TRACK

RAIL has a tendency to "roll out" thus widening gauge. Before inclined tie plates came into use, ties were adzed to cant the rail in. Rail so inclined not only held gauge better but brought the wheel load over the center of the head of the rail.

With the Lundie Plate, the same result is obtained with the important advantage of a bottom which provides at least ten steps of resistance against spreading without injuring a single fibre of the tie, while with the ordinary inclined or wedge shaped plate, tie destroying projections are used in a vain effort to resist the spreading of the track.

The Lundie Engineering Corporation
285 Madison Ave., New York
166 West Jackson Boulevard, Chicago

At Space 89

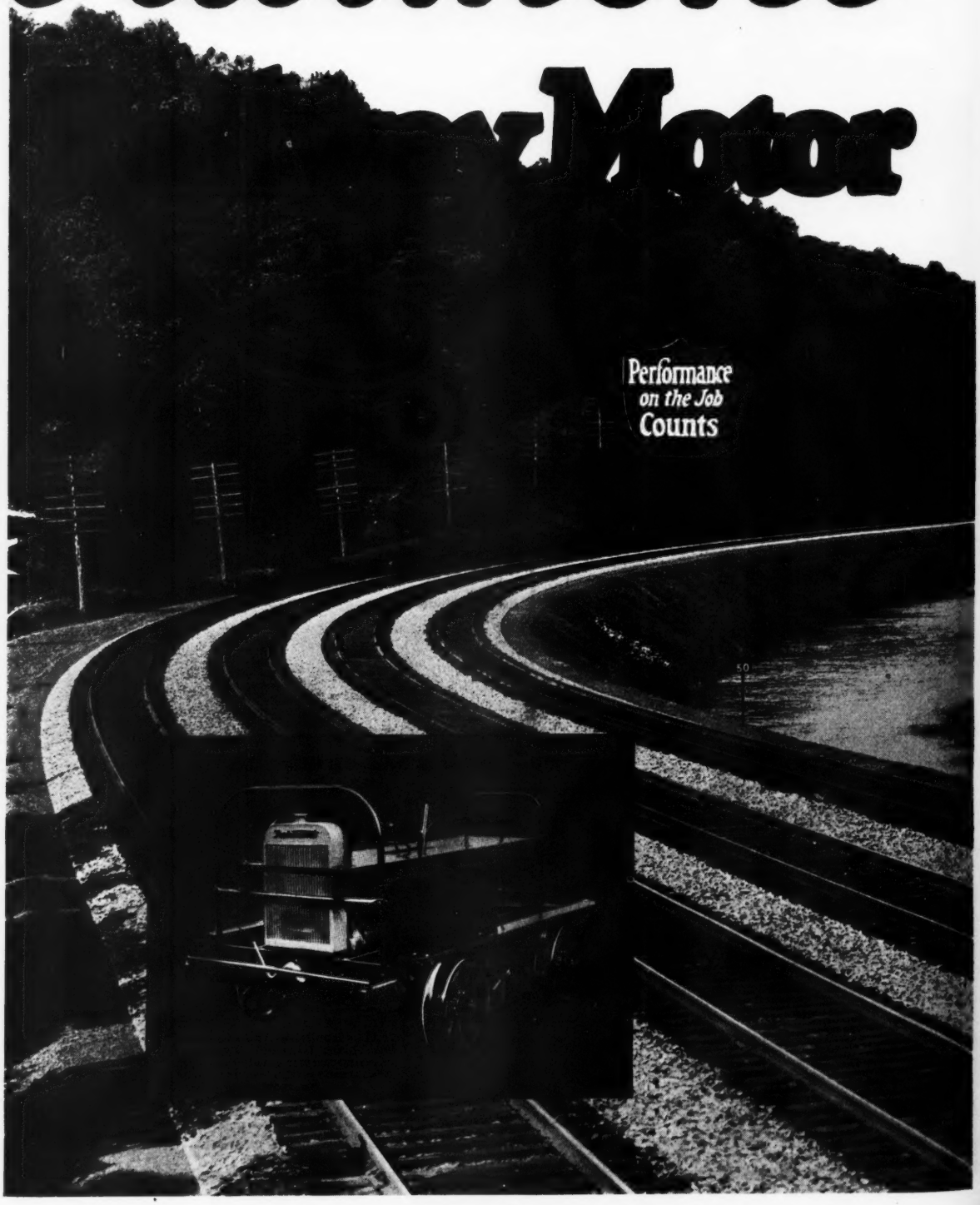
National Railway Appliances Association Exhibit

LUNDIE TIE PLATE

THE RAILROAD

Fairmont

Motor



WORLD KNOWS

AND Mudge Cars

Let OUR "Key Men" unlock YOUR PROBLEMS

One of the popular features of Fairmont Service is the co-operation and contact afforded by Fairmont executives!

Specialists in a *specialized* business, these men stand ready with aid in the solution of any problem which has to do with applying motor cars to railroad maintenance. Co-operation of this type is especially valuable when you stop to consider that *over half of all the motor cars in use are Fairmont Products.*

We would consider it a privilege to serve you as we have others.

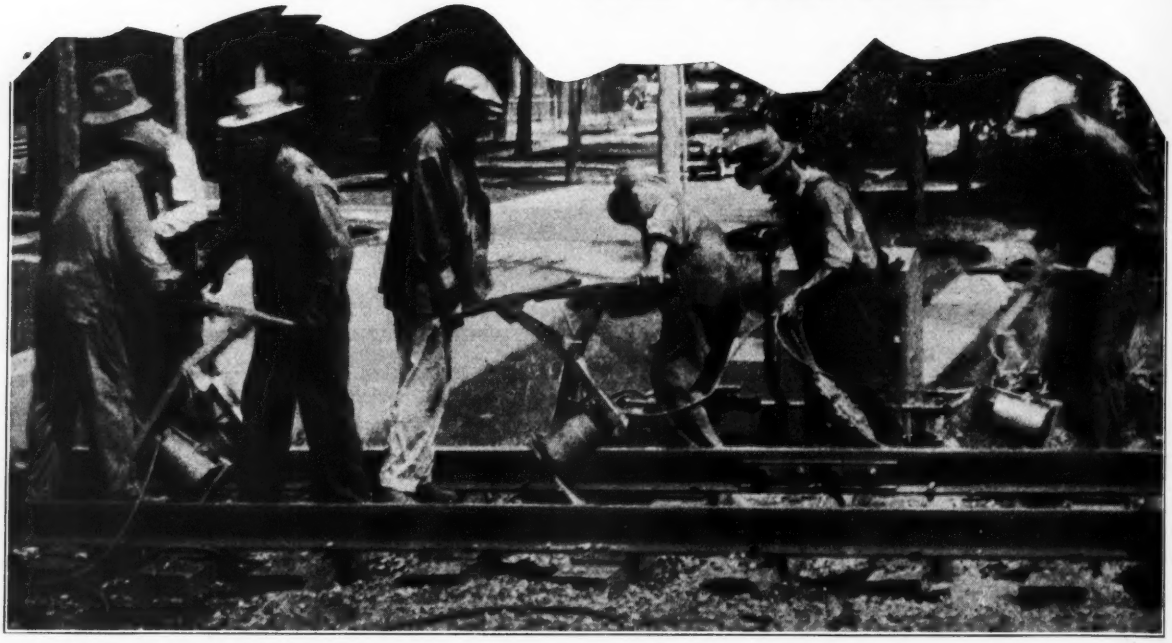
FAIRMONT RAILWAY MOTORS, INC.
General Offices: FAIRMONT, MINN.
General Sales Offices: CHICAGO, ILL.
Branch Offices: New York City; Washington, D.C.; St. Louis; San Francisco; New Orleans; Winnipeg, Can.; Mexico City, Mex.
BALDWIN LOCOMOTIVE WORKS, *Foreign Representative*

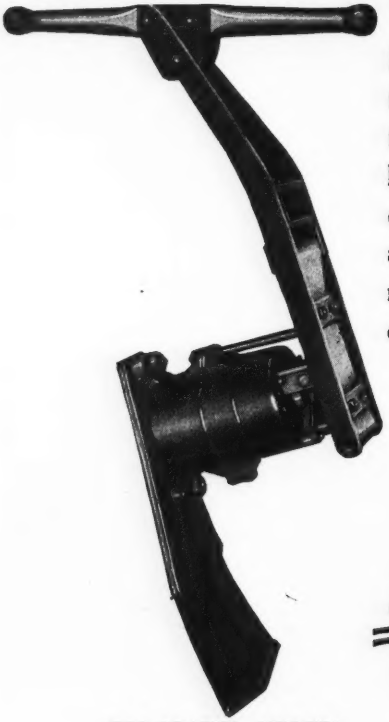
FAIRMONT AND MUDGE PRODUCTS

Section Motor Cars A2–M2–S2–M14–WS2	**Weed Mowers and Discers** M24—M23	**Gang and Power Cars** MT2–A4–A5
Inspection Motor Cars E14–C1–M19–MM9	**Weed Burners** B(M27)–C(M27)	**Push Cars and Trailers** T1–T2–T3–T12–T20 –T24–T25
Roller Axle Bearings Ringseald–Axlsaver Bower–Hyatt–Timken	**Wheels and Axles**	**Motor Car Engines** QB–PHB PHA–QHB and W

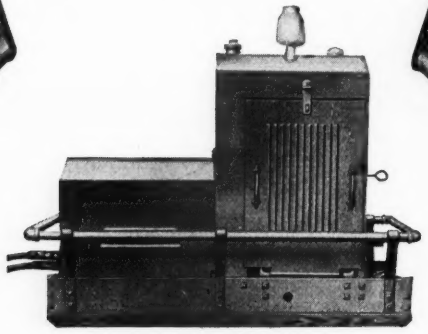
THE IMPROVED

JACKSON UNIVERSAL ELECTRIC TIE TAMPER





Made up in 4, 8 and 12-tool outfits. Capacity from 2000 to 5000 feet per day in gravel and other light ballast; 700 to 1500 feet per day in rock or slag. Cost of operation about 6% per year, maintenance about 2%. Power units exceptionally portable.



FOR GRAVEL, CINDERS, ETC.

SEVERAL SIZES OF POWER UNITS

FOR ROCK AND SLAG

ELECTRIC TAMPER & EQUIPMENT CO.

80 E. Jackson Blvd. Chicago, Ill.

Model 3
on lead off ditches

ten leading railroads have proven NORTHWEST the all-purpose Railroad Machine

Model 3 on bridge building

Model 3
building out shoulders

Northwests are doing the following classes of railroad work

Changing channel. Grading for second track. Cleaning ditches. Loading storage coal. Cleaning after shovel. Making ditch at base of fill. Cutting down knolls. Grading. Loading sand in connection with second track. Completing grade for new siding. Opening up ditch on account of track washout. Making road. Widening shoulders. Loading dirt and mud along side of track to keep track clear. Repair levees. Excavating for oil store. Ditching across right of way. Ditching for sludge line. Cleaning ballast. Laying rail on main line. Driving sheet piling for cofferdam. Excavating for bridge piers. Setting bridge timbers. Excavating for highway crossover. Loading ties. Widening cut. Building new hump. Shifting hump. Excavating to lower grade in hump yard. Loading grade material into cars. Shifting track. Shifting ballast to new track location. Deepening creek under bridge. Ditching for tile drains. Placing signal tower. Loading pig iron from boat to cars with magnet. Cleaning up along roadway with magnet. Distributing rail. Loading rail. Raising track. Setting concrete pipe.

See this machine in Booths 247-8-9 at the Railway Show Coliseum Chicago

NORTHWEST ENGINEERING CO.

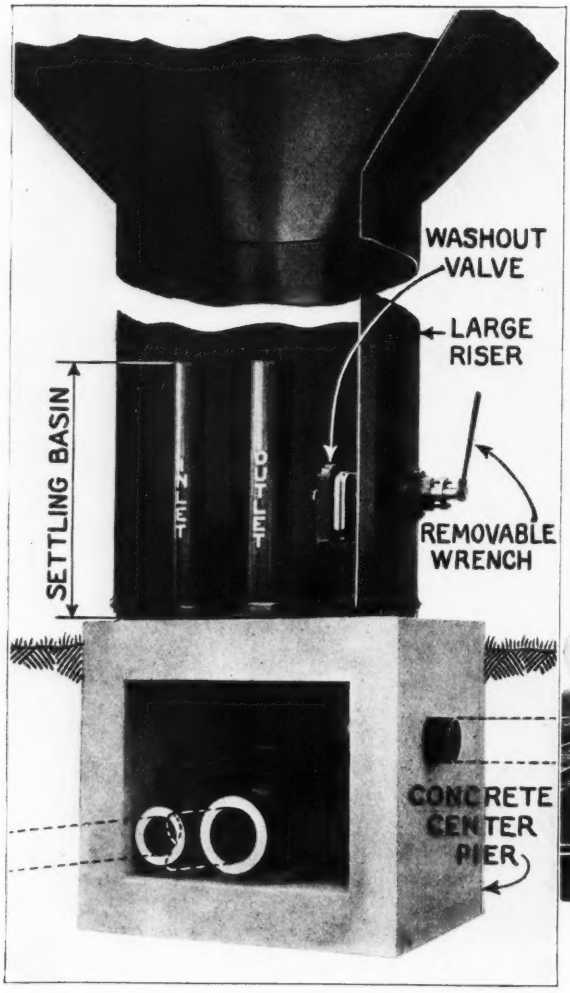
The world's largest exclusive builders of gasoline and electric powered shovels, cranes and draglines

1701 Steger Building, 28 East Jackson Blvd., Chicago, Ill. REM 3—Gray

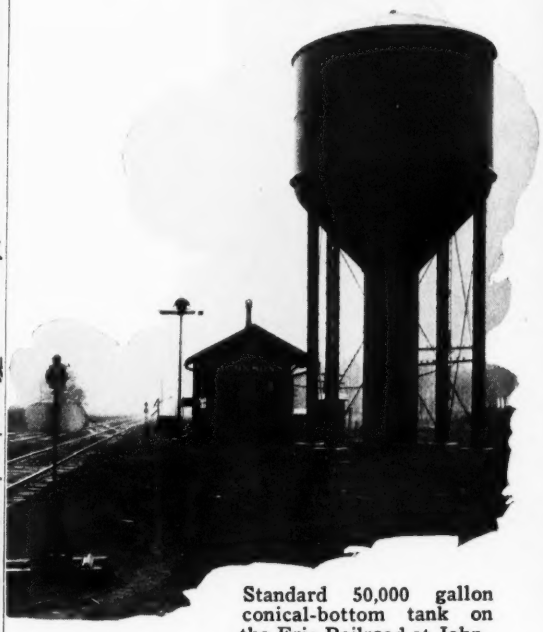
NORTHWEST

Ask about the Model 3 railroad machine

STEEL tanks provide clean water



When attending the A.R.E.A. meeting in Chicago, be sure to visit the railway appliance exhibits in the Coliseum. You will be welcome at our booth No. 85.



Standard 50,000 gallon conical-bottom tank on the Erie Railroad at Johnsons, Ohio.

CONICAL-BOTTOM steel tanks provide an easy means of cleaning the sludge from tanks where dirty water is encountered. The sloping bottom guides settlings into the riser, the bottom of which acts as a settling or collection basin.

Piping connections are extended up through this settling basin as shown in the cut-away drawing. This feature provides clean water for locomotives, as settlings cannot be carried into tenders when taking water. This arrangement also prevents sludge being re-distributed through the tank during filling.

Once concentrated in the small area of the settling basin, sludge is easily and economically removed through a quick-opening washout valve. It may be done at regular intervals by any employee without taking the tank out of service. The pressure of the water in the tank blows out all collected sludge quickly with a small quantity of water.

Easy cleaning is only one advantage of steel tanks. They are long-lived and maintenance costs are low. Ask our nearest office for quotations on the sizes you need at your water stations.

CHICAGO BRIDGE & IRON WORKS

Chicago	2452 Old Colony Bldg.	Detroit	1519 Lafayette Bldg.
New York	3156 Hudson Term. Bldg.	Philadelphia	1609 Jefferson Bldg.
Cleveland	2202 Union Trust Bldg.	Atlanta	1036 Healey Bldg.
Dallas	3309 Magnolia Bldg.	San Francisco	1007 Rialto Bldg.

B-61

HORTON TANKS

TRACK TOOLS

W

That Speed Maintenance Work

THE high quality of Woodings Tools speed up re-laying rail, spiking, spike pulling, lining rail and all track maintenance and construction work.

Your men will recognize the difference the moment they pick up Woodings Tool. They will produce more good work in less time for the tools are properly balanced, properly shaped and finished in a workmanlike manner.

Repeat orders for Woodings Tools prove their ability to stand long hard service. Behind this performance stands quality and behind this quality stands a manufacturing policy that combines the best grades of steel obtainable with capable and experienced workmanship.

Track chisels and mauls are made of high grade alloy steel or electric furnace steel and have a Brindell hardness of 425 to 500 on the striking surface. The track chisels have gained the just reputation of being the finest and most economical rail cutter.

Standard stock sizes are available for immediate shipment at prices worthy of the consideration of the most economical.

Woodings Forge and Tool Co.

Works and General Sales Offices

Verona, Pa.

WOODINGS
STANDARD TRACK TOOLS

"STEAD"
TRUE TEMPER RAIL ANCHOR

Day or Night, Summer or Winter, Single or Double Track,
STEAD ANCHORS always hold the rails safely.
Initial and Application Costs Low.

The American Fork & Hoe Company

General Offices: Cleveland, O. *Factory:* North Girard, Pa.

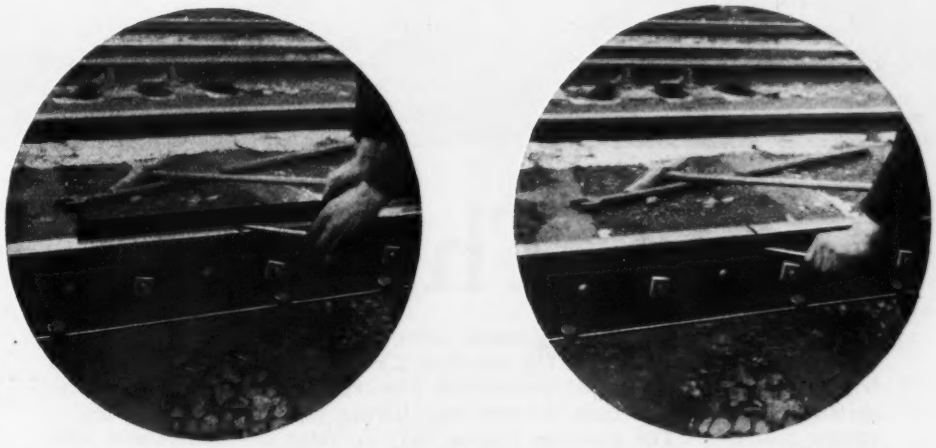
District Offices
Whitehall Bldg., New York, N. Y. Railway Exchange Bldg., Chicago, Ill.

Representatives at
Boston, Detroit, Minneapolis, St. Louis and San Francisco

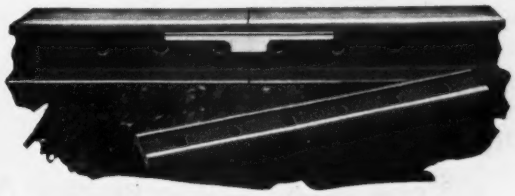
Foreign Representatives
Wonham, Inc., 44 Whitehall St., New York, N. Y.; and 68-72 Windsor House, Victoria St., London, S.W.-1

TRUE TEMPER TAPERED RAIL JOINT SHIM

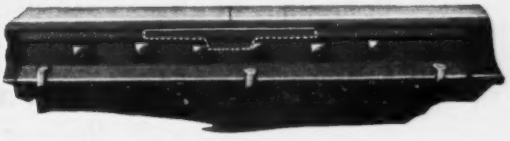
The Remedy for low joints caused by wear



Low Joint conditions quickly and economically corrected by application of True Temper Tapered Rail Joint Shim



True Temper Tapered Shim in position with angle bar removed



Shim shown in position between rails and angle bar

The American Fork & Hoe Company

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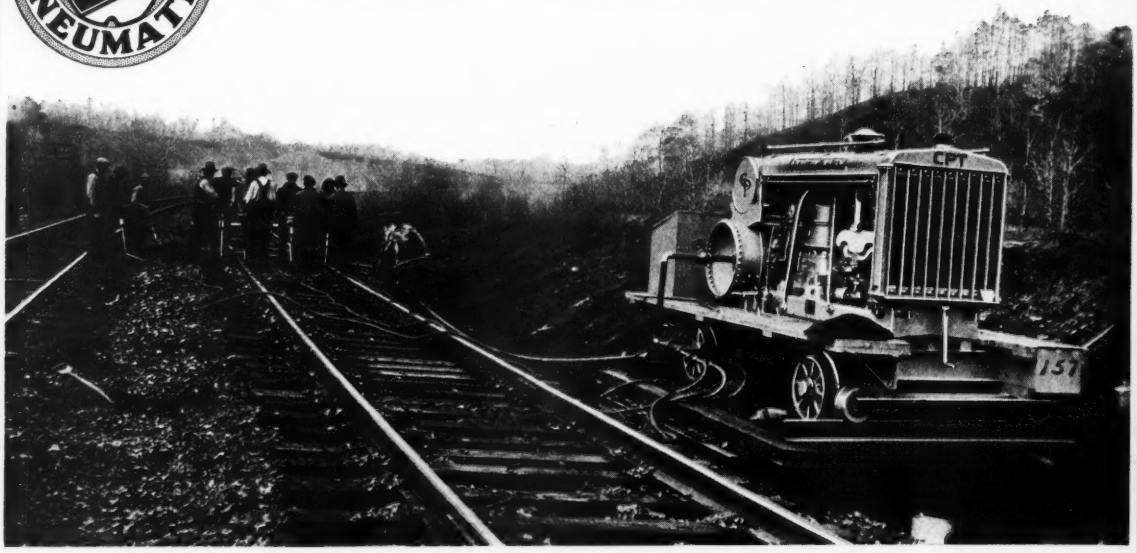
Wonham, Inc., 44 Whitehall St., New York, N. Y.; and 68-72 Windsor House, Victoria St., London, S.W.-1

SELF-PROPELLED COMPRESSOR and "STRAIGHT BACK" TIE TAMPERS



On The Job

MANY railroads are using these units because of their convenience, speed and reliability. The standard CP Compressor is mounted on a truck frame carrying flanged wheels with Timken roller bearings, transverse shifting wheels and winch, air-operated lifting jacks, lifting bale and a roomy tool box. The gasoline engine that operates the compressor also propels the car at a speed of 12 to 18 miles per hour, depending upon its size. The compressor is furnished in sizes of 100, 160, 250 and 310 cu. ft. per minute displacement. The CP Tampers have several interesting features that are fully described in folder No. 1646. Details of the Self-Propelled Compressors are given in Bulletin No. 789.

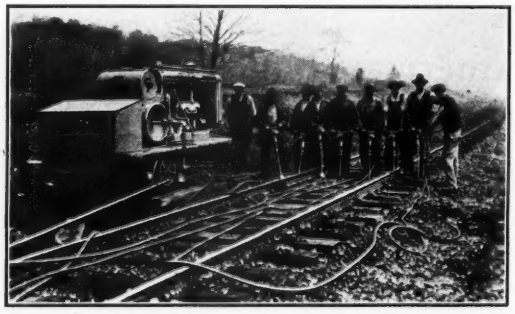
Chicago Pneumatic Tool Company

Railroad Department

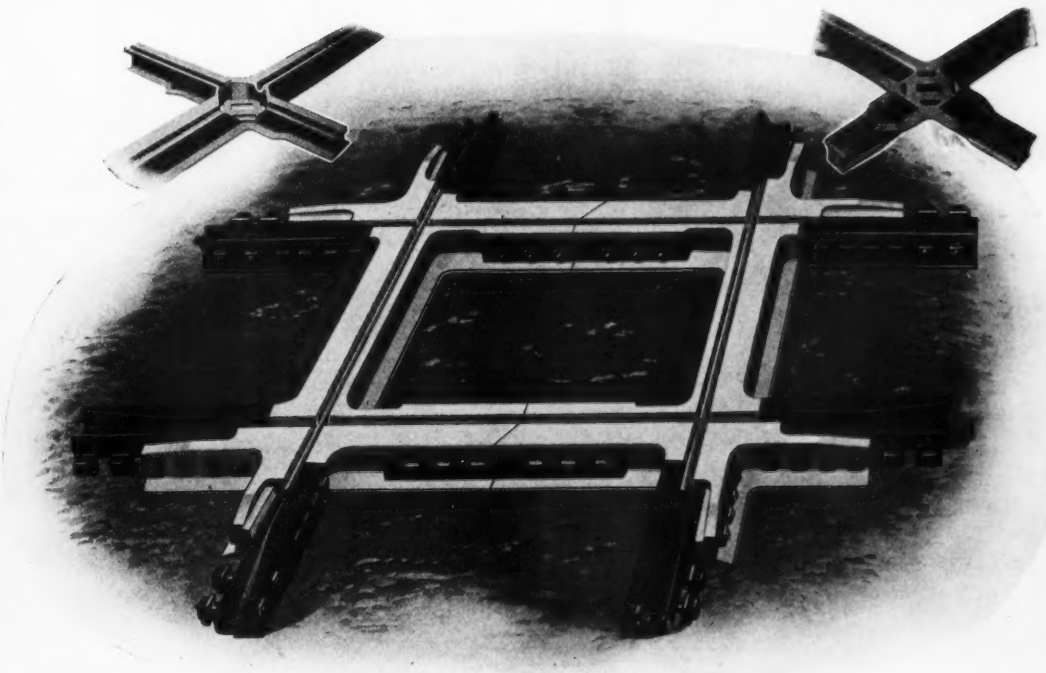
6 East 44th Street, New York
1004 Mutual Bldg., Richmond, Va.
175 First Street, San Francisco
310 S. Michigan Ave., Chicago

J-293

Visit our exhibit. Spaces 202, 203, 212, 213. National Railway Appliances Convention, Chicago, March 4th to 7th, 1929.



Visit our exhibit. Spaces 202, 203, 212, 213. National Railway Appliances Convention, Chicago, March 4th to 7th, 1929.



The NEW Scientifically Designed CROSSING Fulfills Expectations

The New, Scientifically Designed, Wharton Crossing has lived up to every expectation and has made a host of friends, attested by the number sold.

If you have not given this new construction a trial, we know it would be to your advantage to purchase this type for points of severe service.

Beside crossings and other standard track-work, the Wharton Plant is recognized headquarters for mitre and expansion rails for bridges, which require extreme care in machining and assembling.

WM. WHARTON JR. & CO., INC.

EASTON, PENNA.

SALES OFFICES

BOSTON CHICAGO EL PASO MONTREAL NEW YORK KNOXVILLE
PHILADELPHIA PITTSBURGH SAN FRANCISCO SCRANTON FT. WORTH

KREOLITE

We Distill Our Own Creosote Oil

By so doing it is possible for us to insure to the purchaser a uniform pure product of any grade desired. We have treated hundreds of millions of feet of timber in the past 17 years without a single instance of decay.

By the installation of the latest and most modern framing and boring machinery, we assure the purchaser of timbers most accurately framed at lowest cost.

Enormous stocks of Cross Ties, Switch Ties, Structural Timbers and Piling, in all sizes, in Solid Oak or Pine, properly sticked and air seasoned before treatment, available for prompt shipment from Toledo, Ohio, or our Midland Creosoting Company plant at Granite City, Ill., (East St. Louis).

THE JENNISON-WRIGHT COMPANY, Toledo, Ohio

Branches in All Large Cities

R.R. TIES

The DURABLE MODEL B

This is real labor saving— with no sacrifice of stopping power

MECHANICAL

There is little labor in—

Drilling a few holes in running rails—
all standard track bolt sizes.

Assembling a few simple parts
that have all previously been fitted at our plant.

And there are no big holes to dig—this is a
big advantage in cold or bad weather.

Such simplicity of construction and labor saving incidentally mean money saving and time saving. They are the constructional advantages in DURABLE —Model B—Bumping Posts.

At your track ends—all cars—even the newest and heaviest—stop before doing damage, if there is a DURABLE Model B there. We have tested the posts, customers have tested them, and we know. All models of DURABLE Posts from their very beginning have been built first of all to stop cars and the new "Model B" is strongest of them all.

DURABLE B specifications and complete description are in our Bulletin 20A which for its information should be in your files. If you will write for it, we will be glad to mail you a copy.

The Mechanical Manufacturing Co.

Union Stock Yards, Chicago, Illinois

DURABLE—Model B—will be on exhibition at the Railway Maintenance of Way Show March 4, 5, 6 and 7—Booths 245 and 258

RAILS & SPLICES

Into every rail and splice bar manufactured by this company the name "Carnegie" is rolled. This name on steel represents years of conscientious effort to give steel users better products—it represents control of manufacture from the mining of the ore to finished product—it represents unlimited facilities for proper manufacture—it represents the work of experienced metallurgists—the pride of skilled workmen in their craft. It represents a friendly spirit of service and cooperation. Carnegie Rails and high carbon, oil quenched Splice Bars bear this name—our guarantee of your satisfaction. Whether your order be small or large, you may expect the same prompt and efficient service.

Let us quote on your next requirements

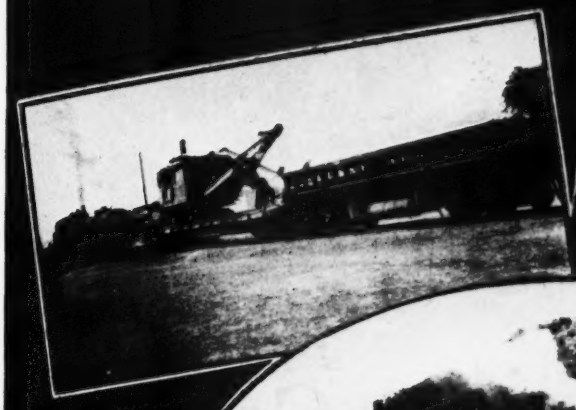
CARNEGIE STEEL COMPANY

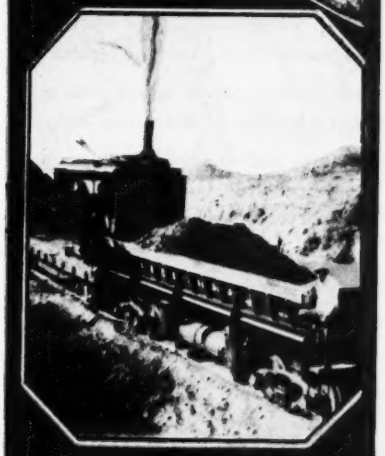
Subsidiary of UNITED STATES STEEL CORPORATION

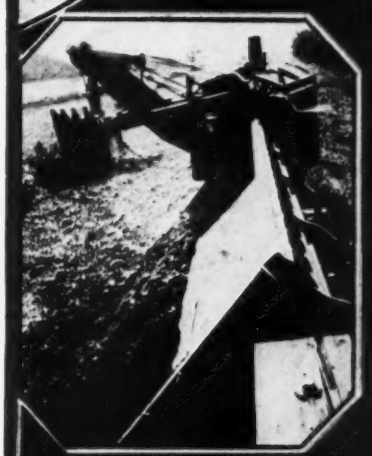
CARNEGIE BUILDING—PITTSBURGH, PA.

1943

They Save Their Own Cost







MAGOR two-way side hinged dump cars have many distinctive features of design which insure efficient and economical dump car operation. The big savings of time and labor on a wide variety of maintenance and construction work return quickly the cost of the cars.

The cars can be dumped to either side automatically. The load is discharged clear of the track. Stability on track, flexibility of operation, positive dumping action and easy access of control mechanism add to the safe and efficient dumping of all bulk materials.

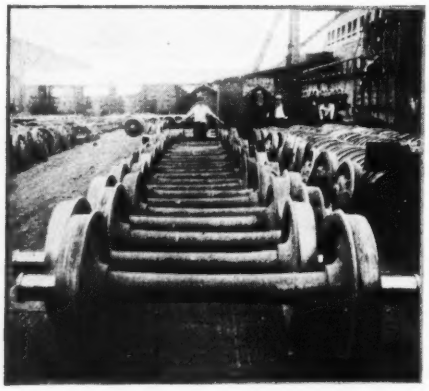
Magor Car Corporation
50 Church St., New York

MAGOR *Automatic Air Dump* CARS

What Mexican Graphite Curve Grease Saves You

ONE thing and but one, determines the actual value of Mexican Graphite Curve Grease—reduced cost of repairs.

This grease, at a cost that is negligible, is a distinct and noteworthy economy when used on your curves as a protector of wheel flanges and rails.



The picture at the left tells what happens without its protection.

This scene is typical of every shop wheel yard where wheels of all descriptions are waiting for removal from axles for repairs.

The same thing is true in track storage points where rails are waiting for disposition after removal because of damage on curves.

Despite long distances, rough routes and inclement weather of every description, Mexican Graphite Curve Grease delivers unfailing protection long after ordinary lubrication has served its purpose.

Time, labor and money saved in wheel removal and track repairs, more than pays initial cost and application.

A trial will convince you of its worth.

The United States Graphite Company

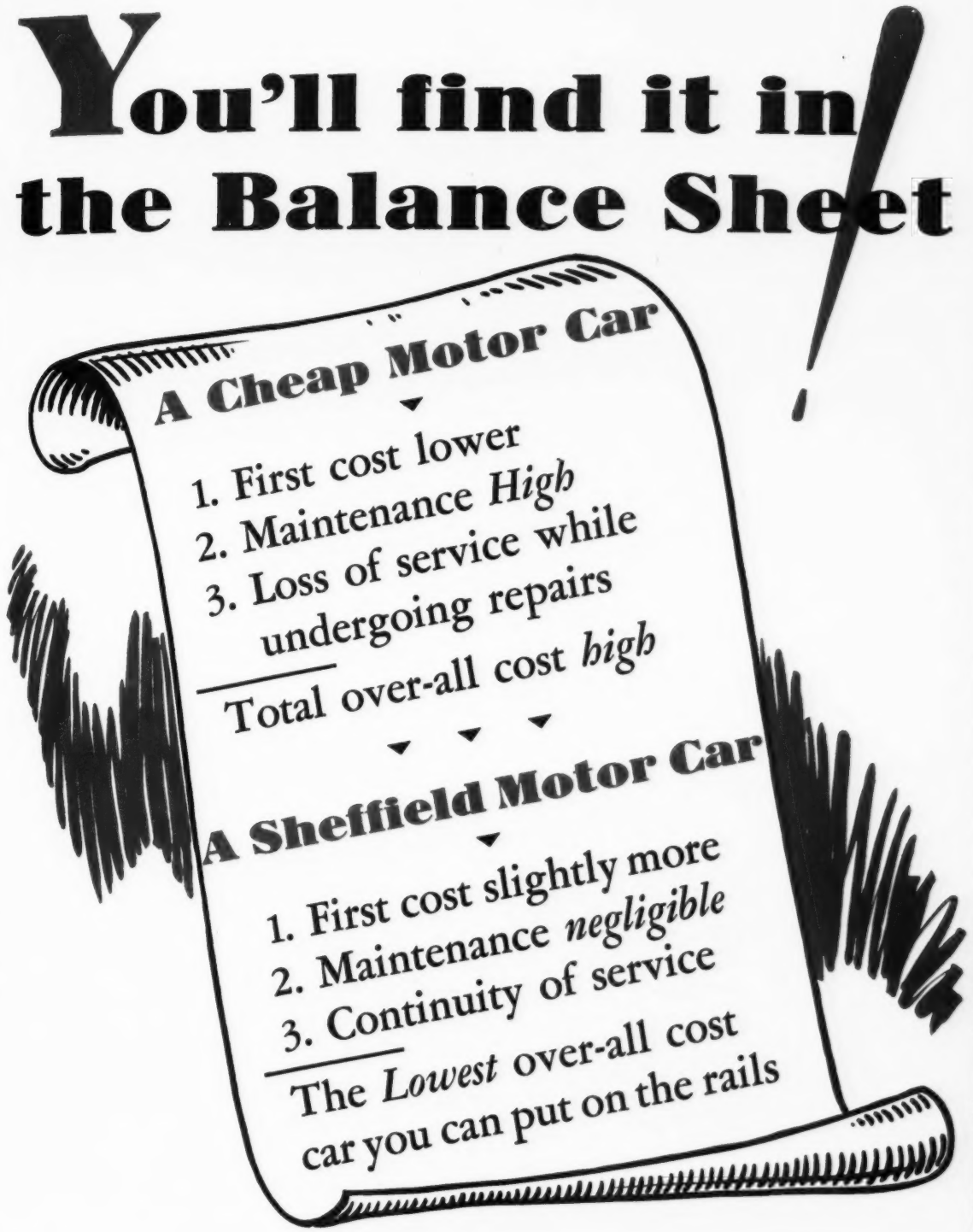
SAGINAW, MICHIGAN

Philadelphia New York Chicago Pittsburgh San Francisco St. Louis

Mexican Graphite Curve Grease USG

SAVES RAILS – REDUCES FLANGE WEAR

You'll find it in the Balance Sheet


A Cheap Motor Car
1. First cost lower
2. Maintenance High
3. Loss of service while undergoing repairs
Total over-all cost high
A Sheffield Motor Car
1. First cost slightly more
2. Maintenance negligible
3. Continuity of service
The Lowest over-all cost car you can put on the rails

TIMKEN BEARING EQUIPPED

F M

FAIRBANKS-MORSE MOTOR CARS

FAIRBANKS-MORSE *Motor Cars*

FAIRBANKS-MORSE *MOTOR CARS*

The "Sheffield" policy!

The first engine driven car to appear on American rails was a "Sheffield." That first car in 1896 was the product of a policy which still guides the Sheffield organization. That policy has made "Sheffield" the leading manufacturer of railway motor cars and trailers—and Sheffield relies on that policy to maintain Sheffield future leadership. Briefly the Sheffield policy is as follows:

1

Sheffield cars shall be the lowest *cost* cars on the market. Therefore, they cannot always be the lowest *priced.*

2

Sheffield cars shall be manufactured with every economy known to modern production methods. But only legitimate economies which do not impair efficiency and dependability shall be employed.

3

If a car the equal of a "Sheffield" is ever produced—*the Sheffield will be lower in price.*

This is the Sheffield policy. America's most completely equipped plant for the manufacture of railway motor cars is back of it.

FAIRBANKS, MORSE & CO., *Chicago*

Manufacturers of railway motor cars; hand cars; push cars; velocipedes; standpipes for water and oil; tank fixtures; oil engines; electric motors; steam, power and centrifugal pumps; scales; complete coaling stations

FAIRBANKS-MORSE

MOTOR CARS

TIMKEN BEARING EQUIPPED

F M

First on the rails—and still first

DEPENDABLE
Spike
and
Bolt
SERVICE

CAST Q IRON
TRADE MARK

THIS "Q-check" mark designates Cast Iron Pipe made in accordance with established technical specifications. The Cast Iron Pipe Research Association has adopted this mark for use by its members.

All pipe, both deLavaud centrifugal and vertically sand cast, made by the United States Cast Iron Pipe and Foundry Company will hereafter bear this symbol. A representative pipe shipment marked with the "Q-check" symbol is shown in the photograph reproduced above, which was taken at the yards of this Company at Burlington, New Jersey.

United States Cast Iron Pipe and Foundry Co., Burlington, New Jersey

Sales Offices: Chicago, Philadelphia, Buffalo, Cleveland, New York, San Francisco, Los Angeles, Seattle, Birmingham, Dallas, Kansas City, Pittsburgh, Minneapolis

The Choice of Leading Engineers ~ ~

STONE & WEBSTER

The choice of Industrial Brownhoists by leading construction engineers is significant, because these concerns maintain large engineering staffs of their own; men who know the good features of a machine's design and can pick its weaknesses.

You can only get out of a crane or shovel what is put into it. That is why a company's engineer, who compares specifications, expects big output, low operating costs and long life from an Industrial Brownhoist. And he gets it.

If you use locomotive cranes or crawler cranes and shovels, you won't go wrong with an Industrial Brownhoist. Nobody yet made a mistake by choosing quality. Crane sizes range from 6 to 200 tons; shovels from ½ to 1¼ yards capacity.

INDUSTRIAL IB BROWNHOIST

Locomotive Cranes 6 to 200 Tons Capacity

Crawler Shovels Cranes

Clamshells

Industrial Brownhoist Corporation, General Offices, Cleveland, Ohio

District Offices: New York, Philadelphia, Pittsburgh, Detroit, Chicago, New Orleans, San Francisco.

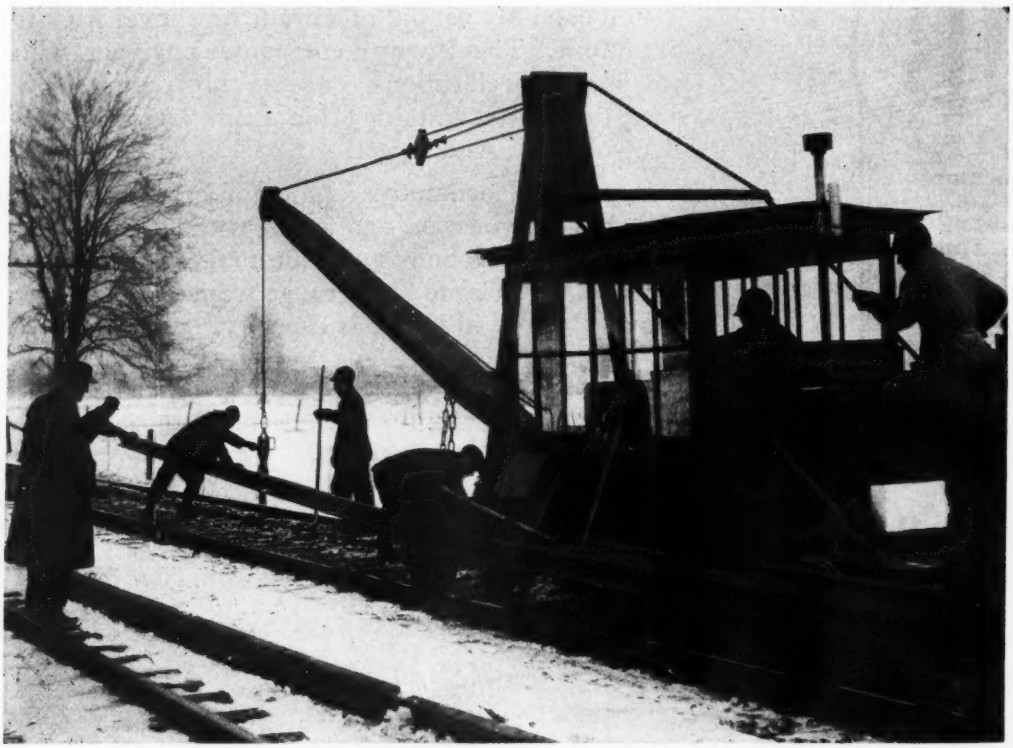
Plants: Brownhoist Division, Cleveland; Industrial Division, Bay City, Michigan; Elyria Foundry Division, Elyria, Ohio.

INDUSTRIAL BROWNHOIST

WINTER—

and a

K & W GAS-ELECTRIC RAIL LAYER



307-39'-130 lb. rails down in one day despite cold, traffic and slippery footing

SPREADING MAINTENANCE LABOR OVER THE YEAR. GREATER SAFETY, FEWER MEN, MORE RAILS LAYED —ASK ABOUT IT.

Write or Wire

THE K&W EQUIPMENT COMPANY

513 W. JACKSON BLVD., CHICAGO, ILL.

"It's a MASSEY Product"

12 Plants
8 Offices

NO more certain guarantee of quality can be furnished on culvert pipe or cribbing than the statement "It's a MASSEY product."

Scores of leading railroads have had long experience with the Massey standard of quality and, as a result, they are consistent users of these precast concrete products.

Get our bulletins on pipe, cribbing, piling, etc., or ask our representatives for any data you need.

Massey Concrete Products Corporation
Peoples Gas Building, Chicago, Illinois

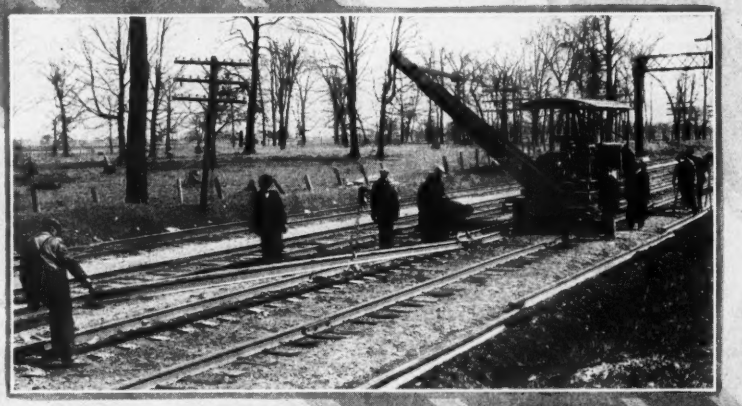
Sales Offices: New York, Atlanta, Cincinnati, St. Louis, Los Angeles
Canadian Concrete Products Co., Limited, Transportation Building, Montreal, Que.

R E M 3-Gray

Track Machinery

These labor and time saving machines were developed for those interested in the maintenance of the track. They provide modern, mechanical methods for replacing operations that have long been done with hand labor.

Nordberg TracKrane



This rail laying and material handling crane has many superior advantages which appeal to those engaged in the relaying of rail. It is full-revolving. The safety hoist permits speed in rail laying and eliminates the possibility of accidents due to careless handling.

Nordberg Track Machine

For track elevation, raising grade, building up fills, new yard construction or wherever track must be raised or shifted, this machine will accomplish more than the ordinary track gang working with jacks and bars. It is arranged to lift track vertically and shift it laterally.

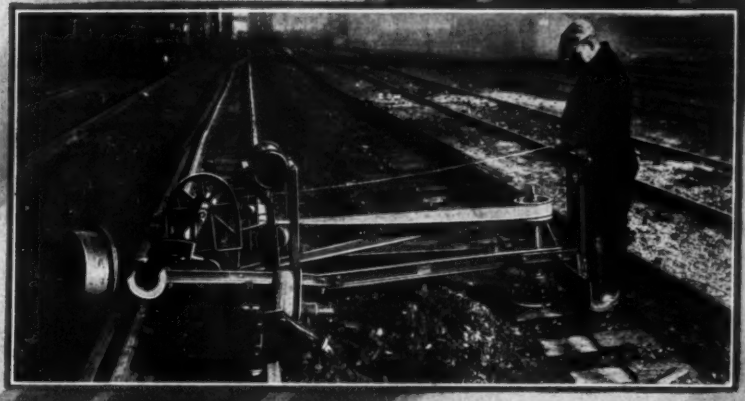
NORDBERG
MILWAUKEE,
Agencies in all

Built by Nordberg

Expensive hand methods are being supplanted in all lines of industry with labor saving machinery. Track machinery developed by Nordberg makes similar savings now possible on track maintenance.

Nordberg Adzing Mach[illegible]

This power adzer with its operator will adz as many ties as 20 men can do with hand adzes. A feature of this machine is the ingenious cutter head, which is not damaged by striking stones or embedded spikes. No rail laying gang is complete without one of these machines.

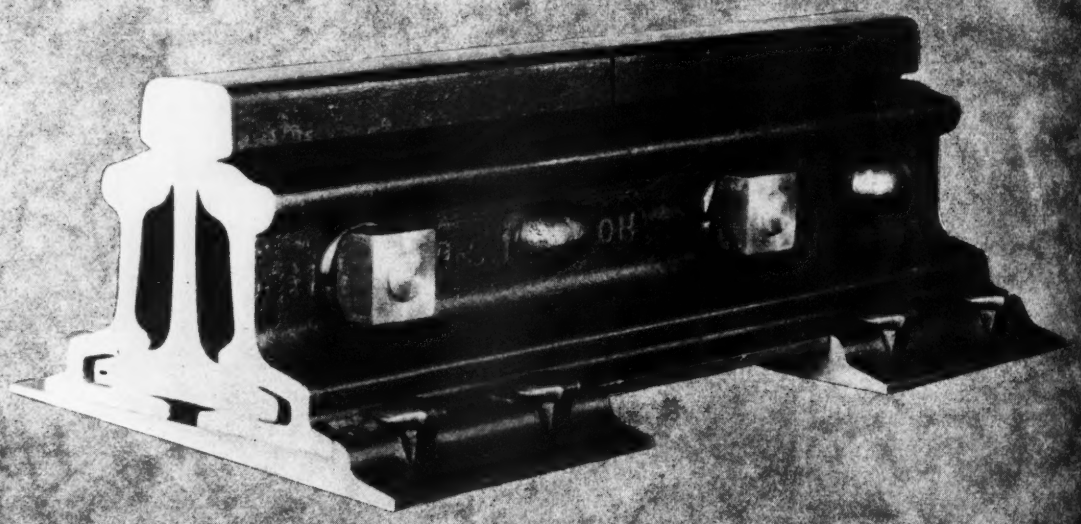


Nordberg Power Jack

This gasoline motor driven jack is primarily a power jack for ballasting work. With its one operator, it replaces the jack gang and keeps from 50 to 80 tampers busy. It is so arranged that both rails can be raised together, one independent of the other, or one raised and the other lowered.

MFG. CO.
WIS. U. S. A.
Principal Cities

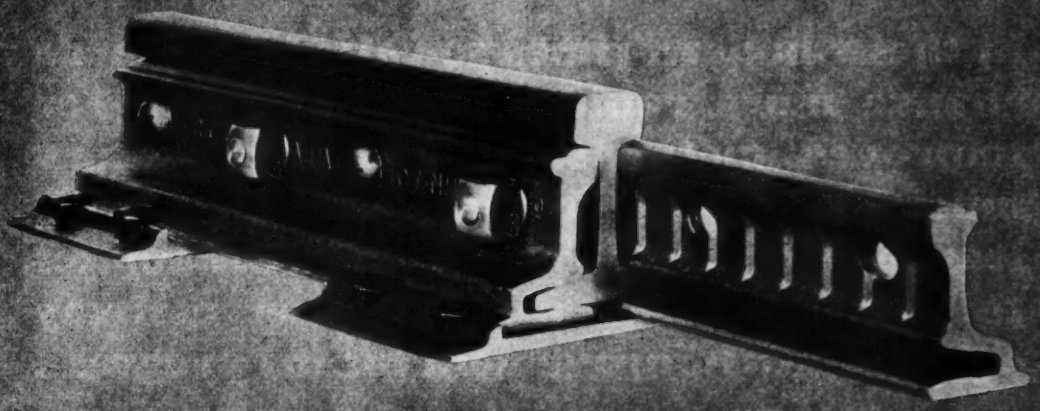
HEADFREE
Continuous
JOINT



NOTHING ELSE
CAN BE USED
ON NEW OR OLD RAIL
OVER AND OVER AGAIN
LIKE A HEADFREE JOINT

The Rail Joint Company
165 Broadway, New York City

Reinforced
HEADFREE
Continuous
JOINT



EASY APPLICATION
AND ECONOMICAL MAINTENANCE
FOR THE TRACK MAN

LARGE ECONOMY IN THE LONG RUN
FOR THE PURCHASER

The Rail Joint Company
165 Broadway, New York City

Improved Standards

By Casey

In these modern times so-called standards change more rapidly to make room for improved methods. Modern machinery must operate better and wear longer with less repair and at lower cost. This applies to Motor Cars as well as other railway equipment. Improvement means progress.

The story of progress as written by Casey Jones is found in the record books of railways who prize efficiency in every department, producing lower operating costs and more profit for them.

Features which have made Casey Jones products so acceptable to railways are not radical, but practical, sensible improvements worked out by an efficient engineering organization assisted by railway men whose experience and judgment are responsible for the rapid advancement of the railway motor car industry.

NORTHWESTERN MOTOR COMPANY

Jones

REG U.S. PAT. OFF.

Casey Jones has introduced many important improvements to place the motor car on a higher standard, first to define the proper classification of motor cars and to offer the correct type of car for each class of service.

THE RIGHT TYPE OF CAR FOR EVERY CLASS OF SERVICE

CLASS	TYPE		H. P.	CAPACITY	SERVICE
CLASS A	Casey Jones	551	22	4 TO 150 MEN – TRAILERS	HEAVY DUTY
CLASS A	Casey Jones	551-H	22	20 MEN	HUMP SERVICE
CLASS A	Casey Jones	551-D	22	8 MEN – ENCLOSED	OFFICIAL INSPECTION
CLASS A	Casey Jones	555	22	10 MEN – ENCLOSED	OFFICIAL INSPECTION
CLASS BB	Casey Jones	523	8	2 TO 60 MEN – TRAILERS	EXTRA LARGE SECTION
CLASS B	Casey Jones	521	6	2 TO 30 MEN – TRAILERS	STANDARD SECTION
CLASS C	Casey Jones	531	4	1 TO 4 MEN	LIGHT INSPECTION

MODERN MOTOR CAR EQUIPMENT FOR EVERY PURPOSE

DISCER	Casey Jones	581	22	ALL DISCING WORK	BALLAST IMPROVEMENT
TRAILER	Casey Jones	552		24 MEN – SEATED	MOVING LARGE GANGS
PUSH CAR	Casey Jones	500		6000 POUNDS	WORK CAR

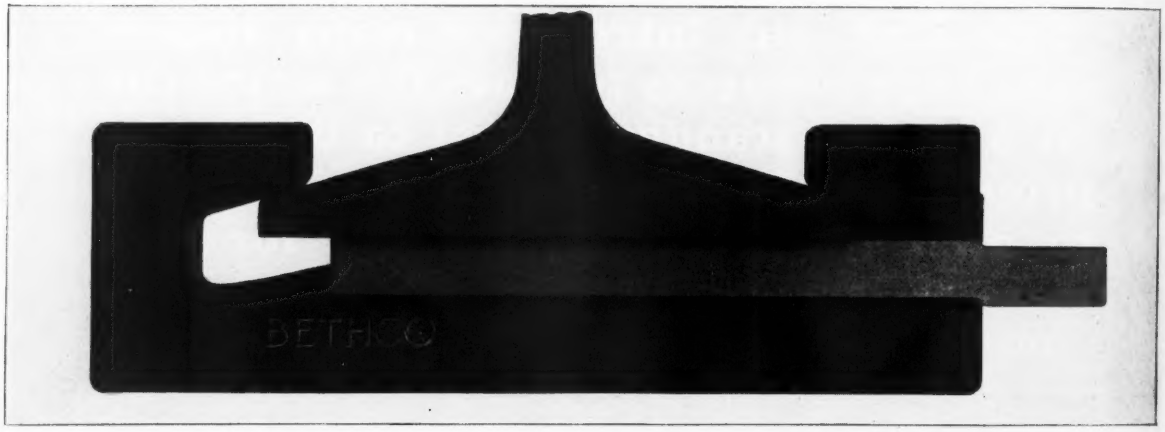
MOTOR CAR FRAMES AND CHASSIS OF ALL TYPES · SPECIAL MOTOR CARS · MOTOR CAR ENGINES 4-6-8 HORSEPOWER · REPLACEMENT AXLES AND BEARINGS · MOTOR CAR SUPPLIES

HYATT · TIMKEN AND BOWER ROLLER BEARINGS

Factory and General Offices: Eau Claire, Wis.

Grips!

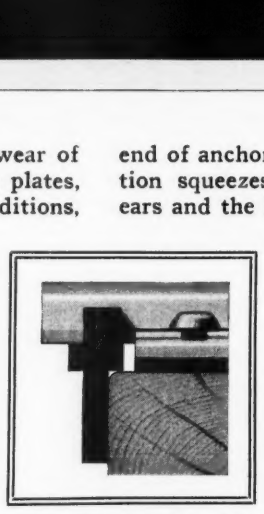
-WHEN *the* RAIL BASE *is NEW and FULL SIZE*



ALL rail bases corrode and wear. The wear of rail bases results principally from tie plates, while at the same time natural weather conditions, brine from refrigerator cars, sulphur water from coal cars, and other factors, cause the rails to corrode.

These conditions do not affect the ability of Bethco Rail Anchors to maintain their binding grip, for they are made to perform their duty on any rail base for which they are designed irrespective of the condition of that rail base.

When the base of a rail is new and full size, the Bethco Rail Anchor takes its binding grip when the key is driven until the offset is even with right-hand end of anchor. (See illustration above.) This action squeezes the base of the rail between the ears and the key by the raising of the key on the humps.



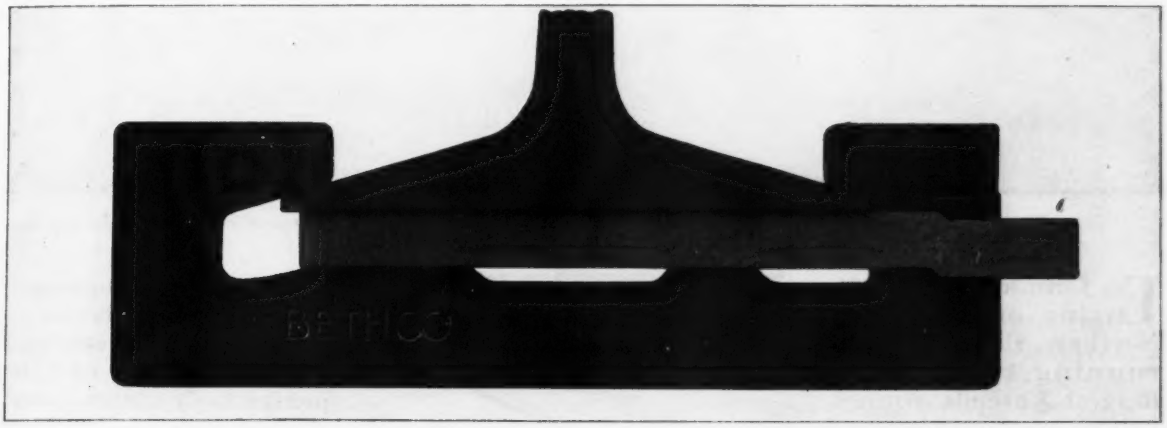
The large bearing surface of the Bethco Rail Anchor prevents tie cutting.

In the case of applying the Bethco Rail Anchor to a worn, corroded or undersized rail base, all that needs to be done is to drive the key farther to a tight fit; this, as can be seen in the illustration on the opposite page, raises the key farther up on the hump which, of course, causes the rail anchor to fit tighter against the rail base.

More and more— railroads are using BETHCO

Grips!

-WHEN *the* RAIL BASE *is* WORN *or* CORRODED



This feature of the Bethco eliminates the necessity of using special size rail anchors for old rails. Besides being so readily adaptable, Bethco Rail Anchors can be used any number of times without losing their gripping power.

Another feature which is exclusive to Bethco Rail Anchors is the extra large surface which bears against the tie. This large flat face of the anchor prevents practically all danger of tie cutting.

Some of the other features of the Bethco Rail Anchor are: Ease of application; "one-piece—two-piece"; built for rough usage; no special tools required; large heavy yoke; self-locking key; reliable in winter weather; holds in either direction; positive grip.

BETHLEHEM STEEL COMPANY

General Offices: Bethlehem, Pa.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Detroit, Cincinnati, Chicago, St. Louis, San Francisco, Los Angeles, Seattle, Portland, and Honolulu

A Product of

BETHLEHEM RAIL ANCHORS

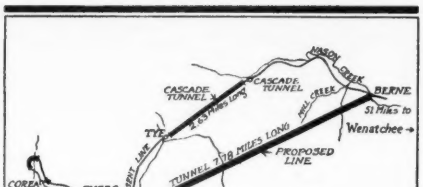
America's longest driven in record time

Du Pont Gelatin

Up the Mountain Sides and through the Snow-

IN January, 1929, the trains of the Great Northern Railway began running through the longest Cascade tunnel, between Scenic and Berne, Washington. The distance between these two points now will be ten miles instead of the eighteen miles involving 1,941 degrees of curvature. Passenger trains will save one hour and freight trains three hours by this new route.

Although the tunnel has cost about fifteen million dollars, six miles of snow-sheds, costing the Great Northern five hundred thousand dollars annually to maintain, have been eliminated. The contractors, A. Guthrie & Co., Inc., of St. Paul, were given only three years in which to drive the 7.78 mile tunnel. In addition to the time element, there were complications such as encountering large volumes of water, a grade of 1.565 per cent, all tangent, and the possibility of drifting operations down grade being brought to a standstill at any time. These difficulties were overcome by driving a pioneer tunnel from both portals; by working four faces from three main camps; by sinking a 622-foot shaft to subgrade; by using the most modern methods, tools, equipment and materials —especially du Pont gelatin dynamite. By the



Showing Routes of the Old and New Cascade Tunnels

DU PONT
REG. U. S. PAT. OFF.

E. I. DU PONT DE NEMOURS & CO., Inc., *Explosives Dept.*, Wilmington, Delaware

railroad tunnel by A. Guthrie & Co., Inc. *used exclusively*

Sheds on the Way to the Cascade Tunnel

application of modern engineering methods, skillful supervision of labor and machinery, and the efficiency of du Pont gelatin dynamite, Guthrie & Co. were enabled to break the world's record for tunnel driving three times in spite of the volume of water encountered which often reached 10,000 gallons per minute.

This work is being carried on under the general direction of J. R. W. Davis, chief engineer, with Colonel Frederick Mears in charge for the Great Northern and J. C. Baxter, vice-president, A. Guthrie & Co., Inc., for the contractors, with W. E. Conroy as general superintendent on the job.

Motion Picture of Construction of Cascade Tunnel

A cameragraphic record of the driving of America's longest railroad tunnel is ready for exhibition.

Requests are invited from engineering societies, colleges and other organizations desiring to see how explosives and modern methods and equipment have been employed to complete the longest railroad tunnel in America. Address requests for motion picture to Motion Picture Bureau of the Advertising Department.

DU PONT

REG. U. S. PAT. OFF.

E. I. DU PONT DE NEMOURS & CO., Inc., *Explosives Dept.*, Wilmington, Delaware

THE AMERICAN SUMP PUMP

THE "American" Type MMD Sump Pump differs from other motor-driven sump pumps in that it employs a hollow shaft motor in place of the old time solid shaft motor.

With this construction a simpler and more compact machine is possible. Flexible coupling and thrust bearing on the pump are eliminated. The pump shaft extends up through the motor shaft and both motor and pump use the same thrust bearing mounted in the upper end of the motor, making end adjustment a very simple matter.

No high motor supports are used, the pump supporting pipe bolting direct to a cast iron plate that in turn bolts to the motor. Distortion of the pit cover will not affect the alignment of the pump and motor.

Pump shaft bearings consist of removable bushings. Pit plate is made of plate steel and can be obtained round or square.

Pumps may be furnished to standard settings up to 17 feet in either single or double units.

All units are furnished complete with float controlled switch, oiling device and

Self-controlled, highly efficient, sturdy in build, they should be considered for your present needs. Complete specifications and catalogs available from our engineering department.

THE AMERICAN WELL WORKS

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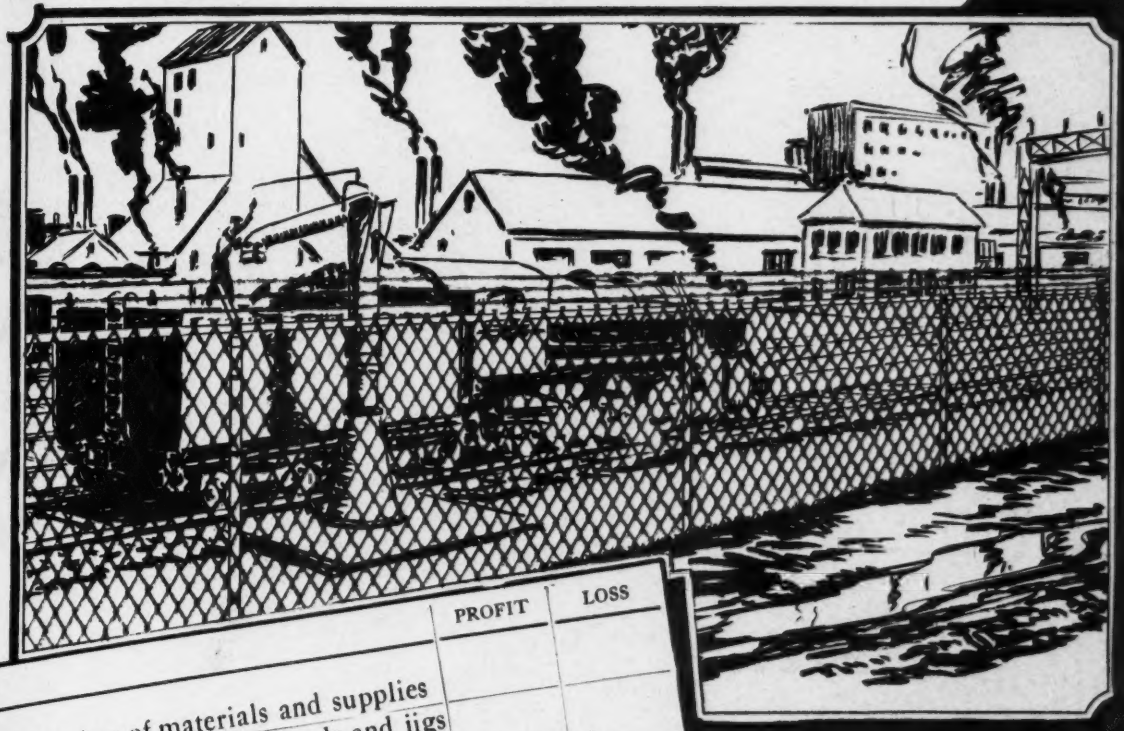
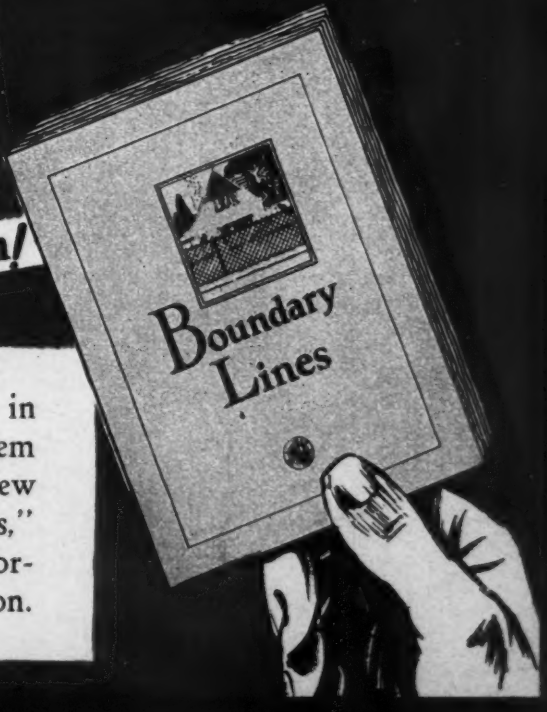
for you who want the *profits of protection!*



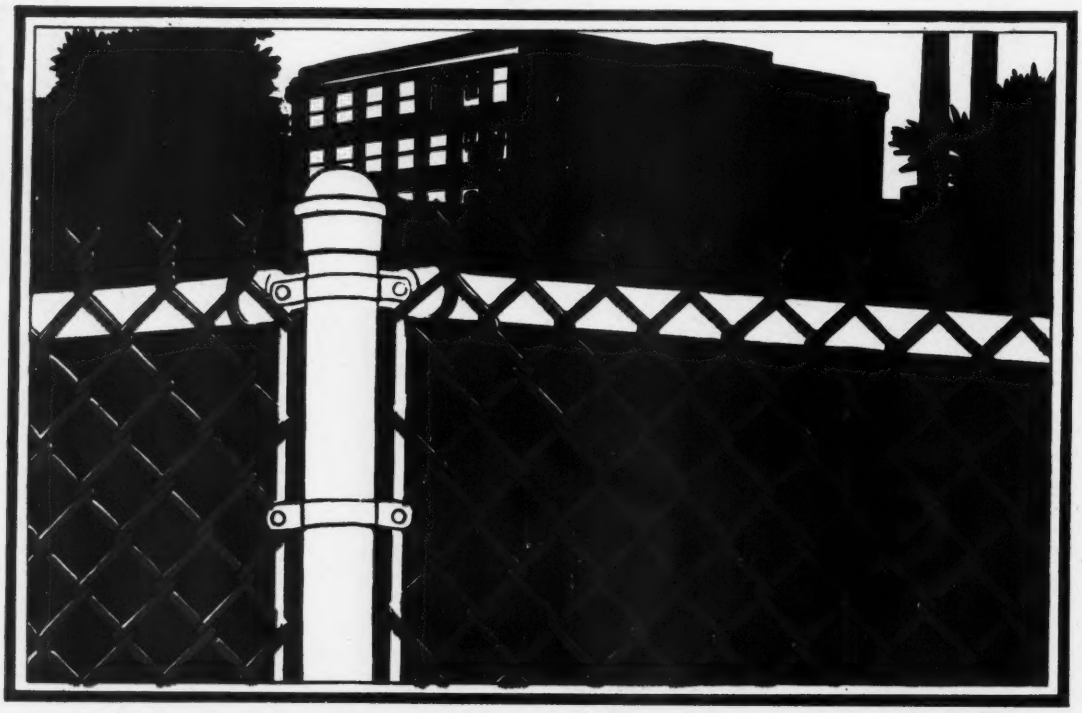
	PROFIT	LOSS
Stop pilfering of materials and supplies		
Stop losses that come when tools and jigs "turn up missing"		
Stop coal-pile borrowing		
Stop personal damage claims		
Stop firebrands and fire hazards		
Stop trade information leaks		

Put these losses in the Profit Column!



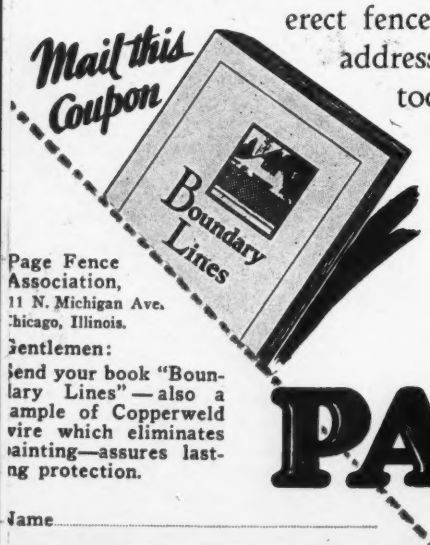
Preventable losses have no place in modern plant operation. Turn them into profit with Page Fence. The new Page plan book "Boundary Lines," just off the press, gives valuable information on better property protection.

now! lasting protection



Page **COPPERWELD** fabric requires no painting—lifetime service

Protected by a molten-welded pure copper exterior, Page Copperweld combines the long-lasting service of copper with the strength of steel. No painting—reduced maintenance—continued strength that assures positive protection. Proved by a decade of use. 53 Service Plants erect fence everywhere. The coupon brings name and address of a Page Service Plant near you. Write today. Page Fence Association, 211 N. Michigan Avenue, Chicago, Illinois.

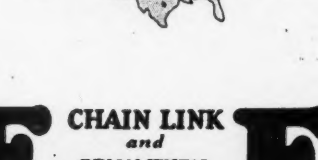


Page Fence Association,
11 N. Michigan Ave.
Chicago, Illinois.

Gentlemen:

Send your book "Boundary Lines"—also a sample of Copperweld wire which eliminates painting—assures lasting protection.

Name.....



5 *daring tests prove* PAGE **COPPERWELD** *combines*

1 The rust-resisting ance of copper
2 The strength of steel.

Bend it

Twist it

Hammer it

Gouge it

Cut it

You can test a sample of this Copperweld wire used in Page Copperweld fabric. Prove for yourself the lasting protection of the copper exterior that is molten-welded to the steel core.

Your Page Service Plant offers complete fence service—Page Copperweld fence, Page copper-bearing steel fence, galvanized after weaving, wrought iron fence, gates and arches. Erection everywhere.

PAGE CHAIN LINK and ORNAMENTAL WROUGHT IRON FENCE

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Printed in U. S. A.

Look how Far your Telephone dollars now Go

When one fish company calls all of its customers everywhere every Monday morning, and conducts all of its business by telephone. . . .

When a single packing house, in one month, receives 1500 calls from its territory ordering meats. . . .

When a flour salesman spends $65 for out of town calls and brings in $500,000 worth of orders in a month. . . .

When this whole magazine might be filled with similar experiences, is it not important that every business man should know how little telephone calls now cost?

There have been rate reductions in 1926, in 1927 and on February 1 of this year. The map shows how far your telephone dollars now go, whether you talk between neighboring cities or half-way across the continent.

What are the problems of your particular organization? Some companies use Sequence Calls to save additional time. Some train special telephone salesmen. Many are now using the Key Town Plan and Credit Plan for their traveling representatives. How could telephone calls save and earn the most for you? A letter or call to your local Bell business office will bring skilled minds to work with yours.

Meantime, what pending out of town transactions could be hastened by telephone?

Bell Telephone Service . . . *Quick* . . . . . *Inexpensive* . . . . . *Universal.*

KOPPEL

A Masterpiece In Design...
A Time Saver In Operation

The Koppel RTD 30

One of the smoothest, fastest, cleanest, safest cars ever put on the track.

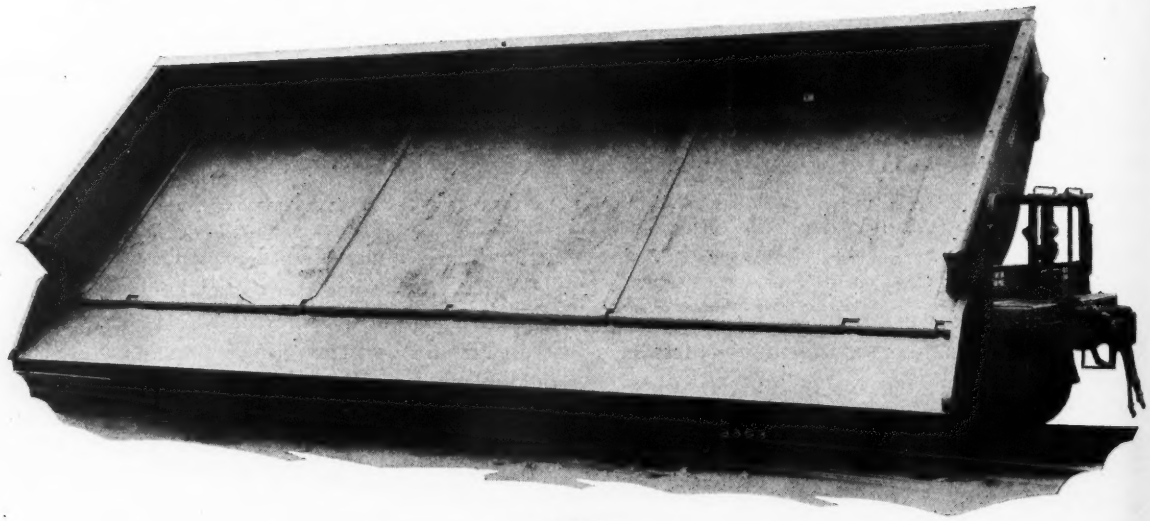
If you have a construction job that requires material handling—you need this car—it will save you time and money.

Complete data on request.

Koppel Industrial Car & Equipment Co.

KOPPEL, PENNSYLVANIA

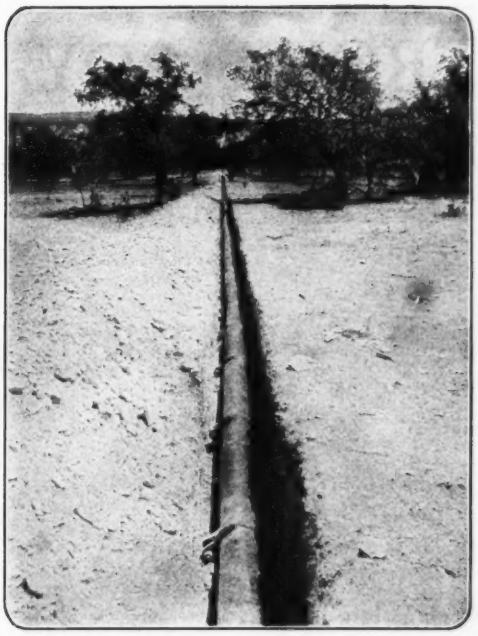
New York · Pittsburgh · Chicago · San Francisco

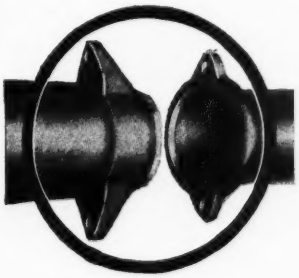


KOPPEL

WATER SUPPLY · FIRE PROTECTION · SEWAGE DISPOSAL

No joints to calk... Savings all along the line...





Easier, Quicker, Safer! No lead nor lead substitutes, nor any other jointing materials to deteriorate or work loose. No pouring, no calking, no bell holes to dig ...Wrenches the only tools.

A Universal Pipe line, no matter how many miles long, is like one solid length of cast iron pipe...because the machined hub and spigot ends as well as the pipe are all-cast iron...Tight, Flexible, Dependable.

OUR NEAREST OFFICE IS AT YOUR SERVICE

A Partial List of Railroads using UNIVERSAL PIPE

PENNSYLVANIA LINES
FLORIDA EAST COAST
NEW YORK, NEW HAVEN & HARTFORD
CHICAGO, BURLINGTON & QUINCY
LONG ISLAND
DELAWARE, LACKAWANNA & WESTERN
MOBILE & OHIO
CANADIAN PACIFIC RAILWAY
BOSTON & ALBANY
BOSTON & MAINE
CENTRAL VERMONT
CHICAGO & NORTHWESTERN
LOUISVILLE & NASHVILLE
WHEELING & LAKE ERIE
INTERNATIONAL RAILWAYS OF CENTRAL AMERICA
TRUXILLO R. R. OF HONDURAS
TELA R. R. OF HONDURAS

UNIVERSAL CAST IRON PIPE

No bell holes to dig: No joints to calk

THE CENTRAL FOUNDRY COMPANY

Subsidiary of The Universal Pipe and Radiator Company

Graybar Building, 420 Lexington Avenue

Chicago Birmingham New York Dallas San Francisco

Do You Want Tool Service with Safety?

USE VERONALLOY TOOLS

CHISELS—ADZES—SLEDGES—MAULS

WILL NOT SHATTER OR FLY

ALL REPAIRS AND
REWORKING CAN BE
DONE ON SECTION
HOUSE GRINDER

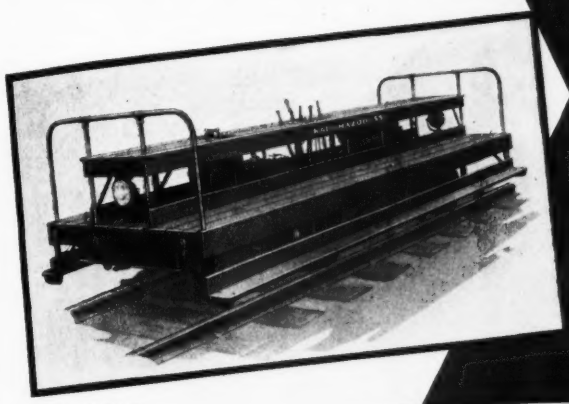
A test lot will convince you

VERONA TOOL WORKS

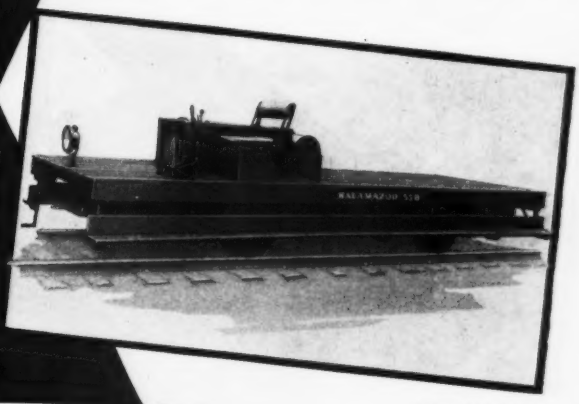
Pittsburgh, Pa.

Est. 1873

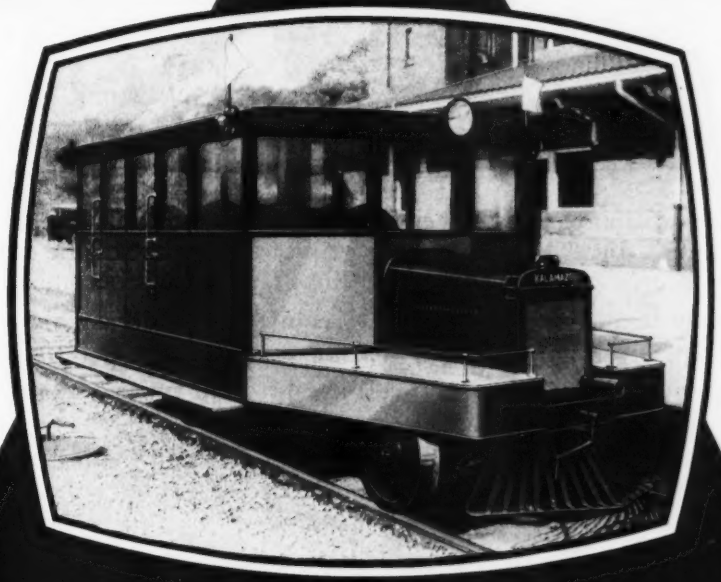
He ty
Lab vers
"KALA AZOO"



No. "55"
Motor Car
Seating Capacity
50 Men



No. "55-B"
Heavy Duty
Work Car

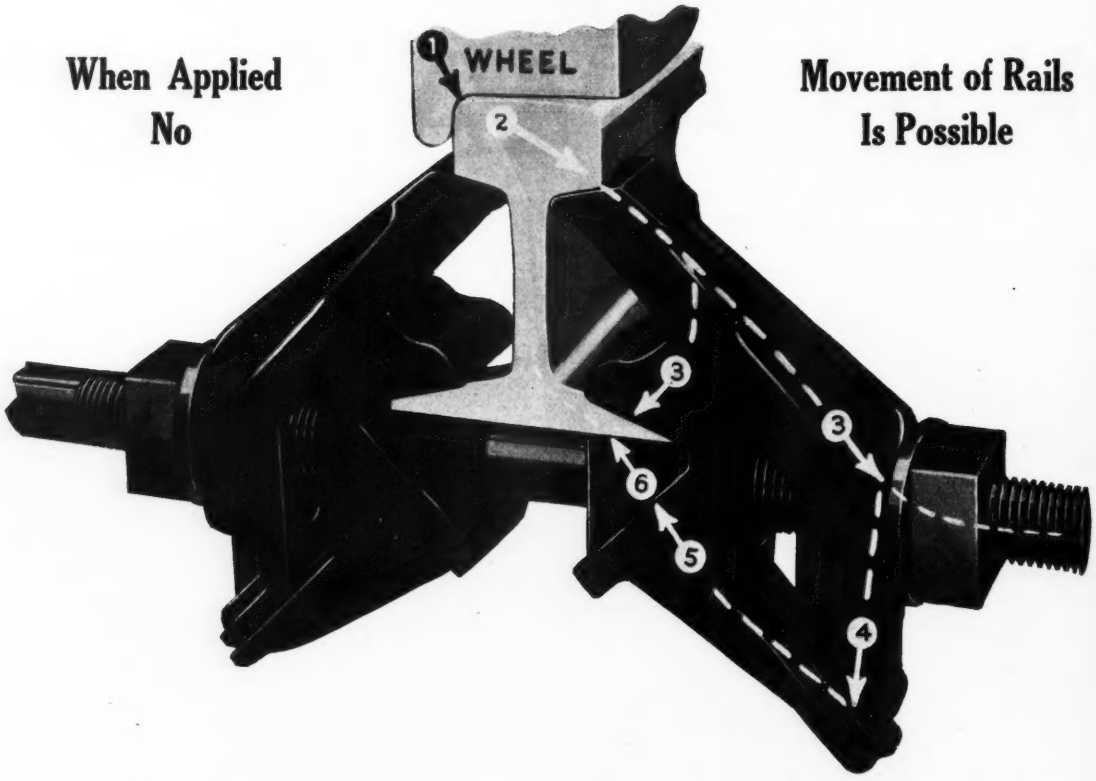


There's a complete line of Kalamazoo Hand and Motor Driven Section, Work and Inspection Cars.

"Kalamazoo Means Service to You"

Shock-Absorber

When Applied No



Movement of Rails Is Possible

This new addition to the Coover Family, checks not only the train shocks, but utilizes these forces to tighten the grip of every part of the device on the rails—the greater the shock the firmer the grip on rails becomes.

In it, is also embodied every device required for a dependable track.

Moreover it is distinctly universal, automatically adjusting itself, when nuts are drawn up, to grip equally well the different types of ARA and ASCE rails, from a 40 to 136 pounds.

The train shock transmitted from wheel to rail and thence to this *Coover Shock Absorber,* makes therein, a complete cycle — exhausting itself in the device. Note arrows as shown in above cut.

This naturally has an easing as well as a cushioning effect on the entire track structure—subsequently prolongs not only the life of each integral part of the track, but makes possible the operation of faster and smoother running trains.

The routine operation of regauging and the shortening of tie-life through spike-killing is a thing of the past.

The Coover Railroad Track Brace Co.

DAYTON, OHIO

Talk about labor-saving!

HERE is a tie-tamping outfit of extreme portability which will show a saving in labor and costs every year of its use.

Briefly, it is a most flexible tamping outfit, powered from a sturdy, light-weight and compact power unit that requires no special equipment for handling and operates a large number of electrical labor-saving devices besides the requisite number of tampers.

Each tie tamper delivers 1500 speedy, powerful blows a minute, is scientifically balanced in weight for easy handling and is self-cooled, easily controlled and packs ballast squarely under the tie.

The SYNTRON Tie Tamping Outfit will show the greatest return on the dollar invested in track maintenance of any tamping outfit on the market.

Write today for literature illustrating and describing these Outfits

SYNTRON COMPANY, 400 LEXINGTON AVE., PITTSBURGH, PA.

SYNTRON TIE-TAMPING OUTFITS

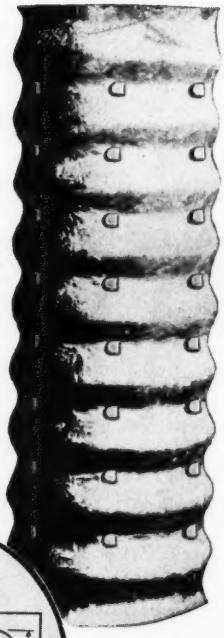
Remove Sub-surface Water With Flexible Sub-Drains Of Toncan Iron

SUB-DRAINAGE structures are subject to many unforeseen strains. Settling foundations, freezing moisture and swelling soil, increasing train loads—such conditions demand flexibility in the sub-drainage structure that is best supplied by drains of corrugated Toncan Iron.

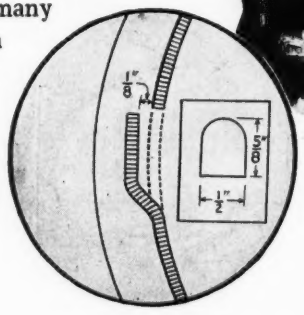
Toncan Iron Drains have all the advantages of corrugated metal drains and two more:

1 They retard the entrance of dirt by the use of outward-tongued perforations instead of usual holes.

2 They are made of Toncan Copper-Molybdenum Iron and therefore possess higher resistance to corrosion and erosion. Copper and molybdenum are alloyed with refined iron to give longer life.



Drains of Toncan Iron give better drainage, eliminate breakage and reduce maintenance for many years to come. Look into this vital Drain improvement made only in Toncan Iron.



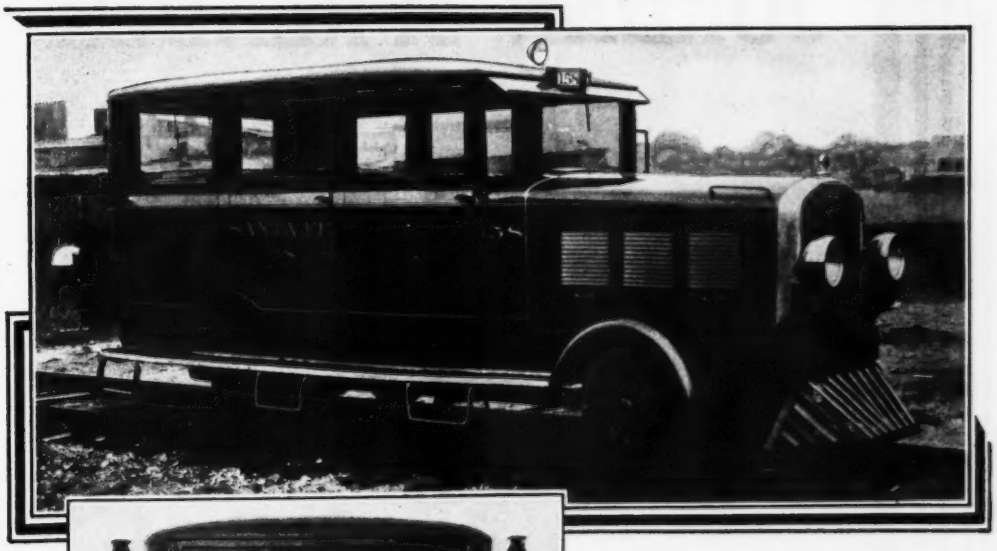
REG. U.S. PAT. OFF.
TONCAN
COPPER
Mo-lyb-den-um
IRON

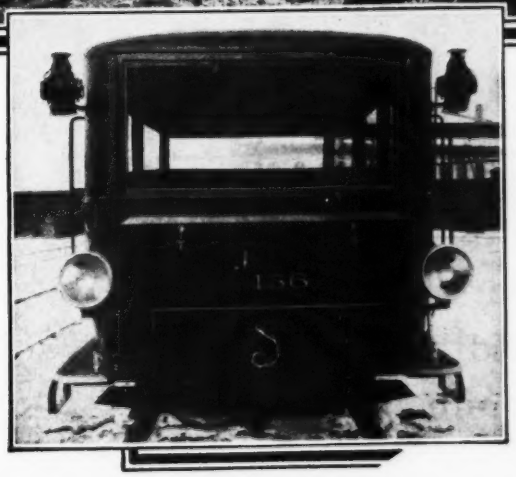
TONCAN CULVERT MANUFACTURERS' ASSOCIATION, MASSILLON, OHIO

The Canton Culvert & Silo Co. Canton, Ohio
The Berger Mfg. Co., of Mass. Boston, Mass.
The Berger Manufacturing Co. Philadelphia, Pa.
The Berger Manufacturing Co. Roanoke, Virginia
The Berger Manufacturing Co. Jacksonville, Florida
The Berger Manufacturing Co. Dallas, Texas
The Berger Manufacturing Co. Minneapolis, Minn.
The Berger Manufacturing Co. (Export), Canton, Ohio
Tri-State Culvert Mfg. Co. Memphis, Tenn.
Tri-State Culvert Mfg. Co. Atlanta, Ga.
The Firman L. Carswell Mfg. Co. Kansas City, Kansas
Wheat Culvert Company, Inc. Newport, Kentucky
Beall Pipe and Tank Corp. Portland, Ore.
Superior Culvert & Flume Mfg. Co. Los Angeles, Calif.
Superior Culvert & Flume Mfg. Co. Oakland, Calif.
The Pedlar People, Limited Oshawa Ontario, Canada

TONCAN COPPER MO-LYB-DEN-UM IRON

BUDA





Note full vision from rear. Also headlights and double windshield wiper

114 H.P. Auto Type Inspection Car

This car was built on Buda No. 619 chassis specially for the Santa Fe. It has a capacity of twelve passengers and is completely fitted with control board, dome lights, curtains, heater, genuine leather upholstering, copper shoe for automatic signals, Wallis-McCormick safety device. The 619 chassis can be adapted to passenger or work train service, logging, hump car, industrial hauling, etc., with 37 to 114 H. P. Buda Engine. Can be supplied up to 24,000 lbs. capacity and for any gauge down to 23⅜ in.

SEND COUPON FOR FURTHER INFORMATION

THE BUDA COMPANY

HARVEY (Chicago Suburb) ILLINOIS

30 Church Street NEW YORK

Railway Exchange CHICAGO

Railway Exchange ST. LOUIS

664 Mission Street SAN FRANCISCO

Cecil Chambers, Strand LONDON, W.C. 2

BUDA ESTABLISHED 1881

THE BUDA COMPANY
Harvey, Illinois

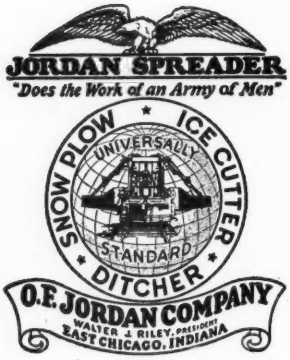
Send me, without obligation, full particulars regarding the motor car advertised in Railway Engineering and Maintenance, March issue.

_____

_____

_____

JORDAN SPREADER



Have you seen this new one with the wings which can be set to spread at any width desired up to a maximum of 24 ft. 6 in.?

An all-year machine in use on North American Railroads.

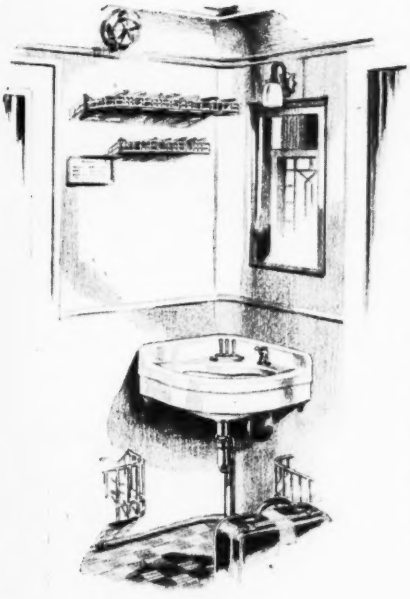
Preferred—
at home, enroute, abroad

In the homes of every Main Street and the towering beehives of business, in hotel and hospital here and abroad, in railroad cars, steamships, public buildings and schools, "Standard"—the world's largest maker of plumbing fixtures—consistently maintains pre-eminence.

What could be more natural, then, that those far-sighted and conservative forces which operate our railroads should increasingly prefer this company in the placing of contracts for railroad *car* plumbing equipment?

Not only does this reflect a consideration for the traveler's contentment, but it evidences the wide acceptance of the extreme serviceability and good appearance of the products of this company.

"Standard" manufactures a *complete line* of railway plumbing fixtures and brass goods. Among the latter, *Chromard Finish Fittings*, distinctively superior in their tarnish-free properties, commend their virtues of beauty and economy to the practical-minded buyer. Inquiry for catalogue is invited.



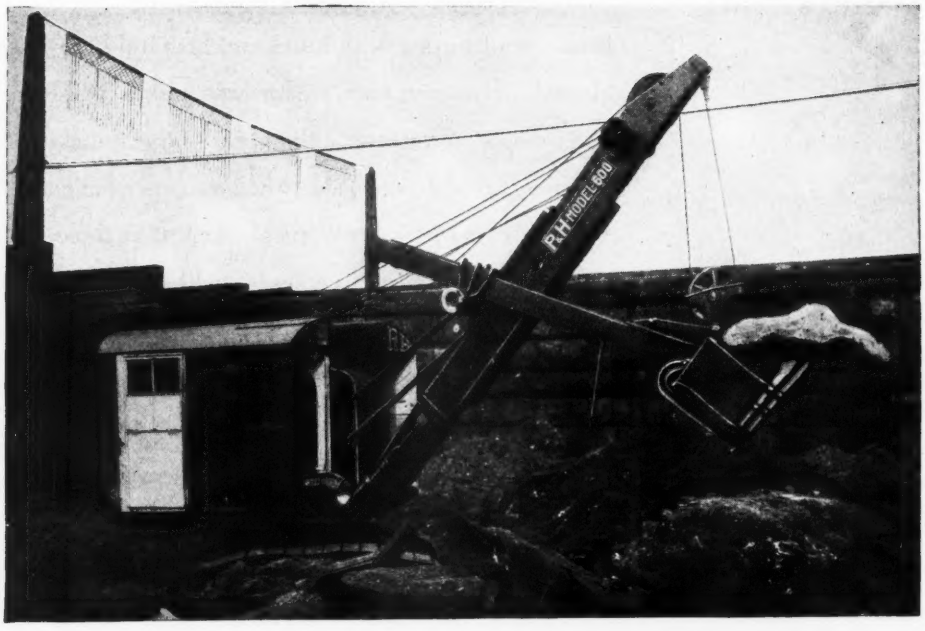
It is not surprising that those who are accustomed to the better things in their homes should seek, in their travels, to surround themselves with a comparable degree of comfort and satisfaction.

Standard Sanitary Mfg. Co.
Railroad Fixture Department
Pittsburgh

"Standard" PLUMBING FIXTURES

THE LARGEST MANUFACTURER OF PLUMBING FIXTURES IN THE WORLD

P&H still going strong after 9 years on the Canadian Pacific



It's performance that counts in railroad service. The Canadian Pacific bought their first P & H Excavator nine years ago—they now have eight and ALL are still going strong.

Some Railroad Users of P & H Excavators

Southern Pacific Co.
Kansas City Mexico & Orient Ry.
Union Pacific R. R. Co.
International Railways of Central America
Delaware & Hudson Co.
Seaboard Airline Ry.
Canadian Pacific Ry.
East India Ry. Co.
Chicago, Milwaukee, St. Paul & Pacific

P&H Excavators can be loaded on standard flat cars under their own power and can be shipped without dismantling.

They are readily convertible into Shovel, Crane, Dragline or Pile Driver.

Handle Ties, Scrap or Construction Material. Dig, load or clean Ballast.

Due to their 2-speed tractions, they move quickly on or off the right-of-way.

P&H Gasoline Powered Excavators are made in 5 sizes, each individually engineered to rated capacity.

HARNISCHFEGER CORPORATION
Established in 1884
3820 National Avenue, Milwaukee, Wis.

Memphis	*Birmingham*	*Los Angeles*	*Cleveland*
Portland	*New York*	*San Francisco*	*Charlotte*
Pittsburgh	*Chicago*	*Dallas*	*Seattle*
Des Moines	*Kansas City*	*Detroit*	*Baltimore*
Phialdelphia	*Indianapolis*	*Boston*	*Jacksonville*
	St. Louis	*Minneapolis*	*Atlanta*

WAREHOUSES AND SERVICE STATIONS
Philadelphia, Memphis, Jacksonville, San Francisco Los Angeles, Seattle, Dallas

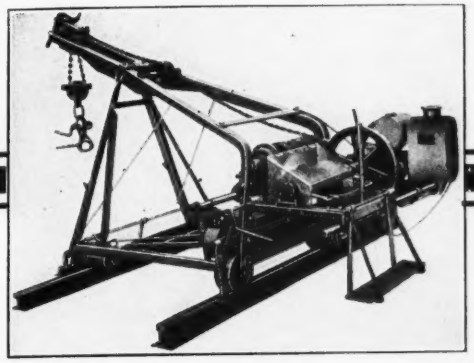
Mail This Coupon for Bulletin 62-X

Harnischfeger Corporation
3820 National Avenue
Milwaukee, Wis.

Please send us Bulletin 62-X covering P & H Excavators:

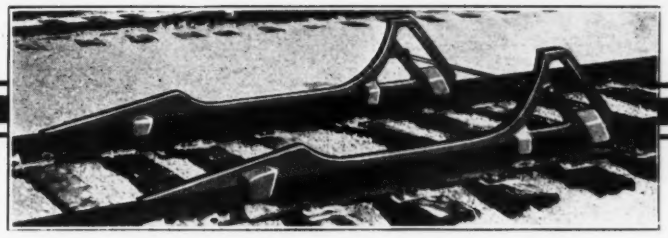
Company Name.....
.....
Address.....
.....
City & State.....
.....
Individual's Name.....
.....

LABOR SAVING TRACK DEVICES

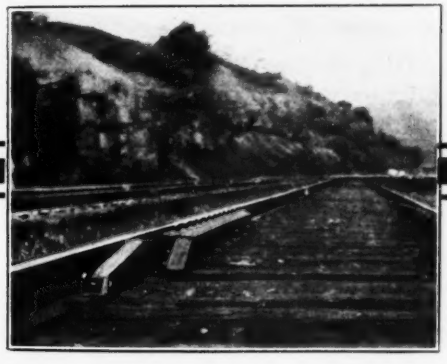


Power Operated Three Man Rail Layer. Also furnished as a hand operated type

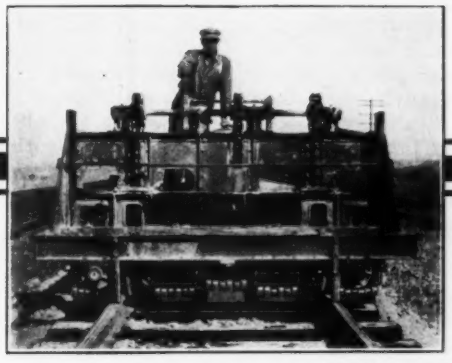
"Mack" Reversible Switch Point Protector



Friction Car Stops



The Derrick Automatic Rail and Flange Lubricator (improved design)



The Jackson Power Track Ballaster without cab

These labor saving track devices are not only cutting operating, maintenance and installation costs, but are greatly increasing the laborer's appreciation for his job on most of the trunk lines of America.

THE MAINTENANCE EQUIPMENT COMPANY

1305 Railway Exchange Bldg. **Chicago, Ill.**

New York Cleveland San Francisco St. Louis

Get on the RIGHT TRACK

If you have anything to do with doors that slide —heavy doors or light ones—you know that the door-hangers run on metal tracks. If the track is wrong the doors don't work properly.

Richards-Wilcox door-hardware—hangers, brackets and track—is so well-made, so carefully and scientifically designed, that when it's properly installed it works right; almost never gives any trouble. We *know it's right.*

Lately we've been getting trouble calls; and when we send an engineer to straighten things out, he finds that the job has been "botched" by putting up some other track than ours. There are cheap substitutes being made, and sold to unwary buyers by dealers who care more for an extra profit than for an honest value to a customer.

The hangers and brackets have our trade-mark and name stamped on them; so has the track we make. It isn't a real Richards-Wilcox job unless our name is on the hangers, brackets and track.

You'll avoid trouble by being sure of our mark. Look out for any attempt to sell you anything else. The guarantee does not apply unless hangers, brackets and tracks are Richards-Wilcox.

The R-W LOCK JOINT TROLLEY TRACK

Richards-Wilcox Mfg. Co.

A Hanger for any Door that Slides

New York . . . AURORA, ILLINOIS, U.S.A. . . . Chicago

Boston Philadelphia Cleveland Cincinnati Indianapolis St. Louis New Orleans Des Moines Minneapolis Kansas City Los Angeles San Francisco Omaha Seattle Detroit

Montreal RICHARDS-WILCOX CANADIAN CO., LTD., LONDON, ONT Winnipeg

One tiny vulnerable spot — Death found it!

THETIS, goddess mother of mortal Achilles, Hellenic hero of Trojan war, plunged him into the River Styx to make his body invulnerable. But she held him by one heel, which the waters did not cover with their protective charm. Before the bloody walls of besieged Troy, Achilles wrought havoc and destruction among the Trojans, himself escaping wounds, defying harm. And then, as he stood in the temple of Apollo, negotiating with Priam for the hand of his daughter, Polyxena, the poisoned arrow of treacherous Paris found his vulnerable heel, dealing death. The magic of the Styx was good protection as far as it went. But its application had lacked thoroughness.

It is fact, not legend, that destructive termites (white ants), woodpeckers, decay-producing fungi or marine borers are swift to find the vulnerable spots in partially, improperly or under-treated transmission poles, cross ties, bridge timbers or piling. Spotty or uneven penetration of the preservative does not afford complete protection. And treated wood is no safer than its least protected spot.

Thoroughness distinctively characterizes Prettyman timber preservation. The most complete and modern pressure treating plant in the industry, coupled with finished engineering skill and care, assure deep and uniform penetration full length to the heartwood with creosote oil conforming to standard A. R. E. A. specifications. It completely encases the heartwood in highly toxic sheathing, thick as the sapwood itself. It leaves no vulnerable spots. Yet, Prettyman Preserved Forest Products cost no more. Write for prices.

No vulnerable spots here!

PRETTYMAN PRESERVED FOREST PRODUCTS P29

Note thorough penetration of creosote oil

J. F. Prettyman & Sons
Wood Preserving Plant
Charleston, S. C.

Section cars that enjoy TIMKEN economies

Sheffield 45 Section Car, one of the types made by Fairbanks-Morse & Co. and equipped with Timken Bearings.

The "Sheffield" line of section cars is a typical example of machinery of greater economy. The builders, Fairbanks-Morse & Co., are eliminating friction and wear wherever possible. In the engine crankshaft and in each axle there are Timken Tapered Roller Bearings.

In all types of machinery for shops, in turntables, car retarders, and in rolling stock Timken Bearings are contributing economy by their power and lubricant savings, endurance and freedom from maintenance. Timken economies are so certain because Timken tapered construction, Timken *POSITIVELY ALIGNED ROLLS* and Timken electric steel enduringly withstand every load including thrust.

THE TIMKEN ROLLER BEARING COMPANY
C A N T O N , O H I O

TIMKEN
Tapered
ROLLER BEARINGS

Always on the Job

With its wide range of utility, the Buckeye reduces non-productive hours to a minimum. Easily shifted from one job to another under its own power, it handles full length rails, frogs, switches and other construction materials. It also efficiently handles locomotive cinders, coal, concrete aggregates (gravel and stone), etc., meeting every requirement of construction and maintenance within its capacity.

The telescopically adjusted boom, the full circle swing, two speeds for every operation, in combination with its reliable heavy duty motor and one man control make it fast, flexible and economical in service.

Flanged wheel mounting permits it to operate from the track or from rails laid on flat cars. Alligator (crawler) traction is also available for other services independent of the tracks.

Write us for full specifications of construction and utility. Price, $4,800 f.o.b. factory with steel cab and flanged wheel equipment.

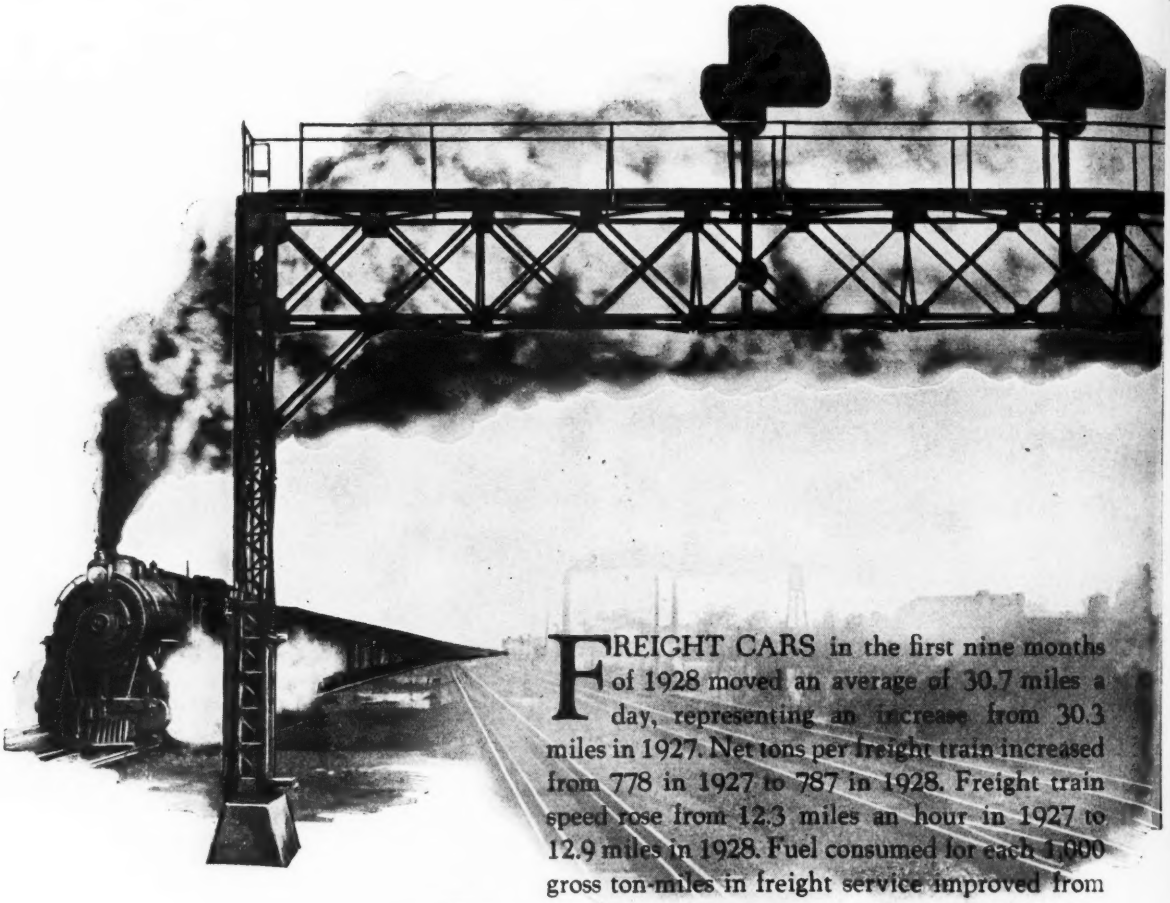
EVERY DAY IT PAYS ITS WAY

THE BUCKEYE TRACTION DITCHER COMPANY
FINDLAY, OHIO

There's a Buckeye Sales and Service Office Near You

for over thirty years
Buckeye

Bettered Operating Performance



FREIGHT CARS in the first nine months of 1928 moved an average of 30.7 miles a day, representing an increase from 30.3 miles in 1927. Net tons per freight train increased from 778 in 1927 to 787 in 1928. Freight train speed rose from 12.3 miles an hour in 1927 to 12.9 miles in 1928. Fuel consumed for each 1,000 gross ton-miles in freight service improved from 148 pounds in 1927 to 122 pounds in 1928.

OXWELD RAILROAD SERVICE

For more than 16 years, The Oxweld Railroad Service Company has been a factor contributing to the constant betterment of Railway operating performance. By supplying the oxwelding needs of most of the important railways in the country it is helping to establish these remarkable records of progress.

THE OXWELD RAILROAD SERVICE CO.

Unit of Union Carbide and Carbon Corporation

UCC

NEW YORK CITY: Carbide and Carbon Building

CHICAGO: Railway Exchange Building

"When . . . every hour counted *this Armco culvert saved weeks"*

"Our first plan for the new branch line called for completion of this bridge after the fill had been put in place.

"This meant several weeks' delay after the work of making the fill had been finished—several weeks of inactive investment—several additional weeks of operation over a longer route and steeper grades. With a change to Armco Corrugated Pipe, the necessary drainage capacity was provided so the fill was carried through in one operation—there was no delay for completing this bridge."

Additional data on specific instances, like the one described above, where Armco Corrugated Pipe helped reduce the time and cost of construction, and increased operating efficiency, gladly given on request. Write also for copy of interesting bulletin, "Applying Culvert Simplicity to Railway Bridge Problems."

Armco culverts and drains are manufactured from the Armco Ingot Iron of the American Rolling Mill Company and always bear its brand

ARMCO CULVERT MANUFACTURERS ASSOCIATION
MIDDLETOWN, OHIO

ARMCO *corrugated* PIPE

©1929, A. C. M. A.

The "WOLF"

Portable Timber Sawing Machine

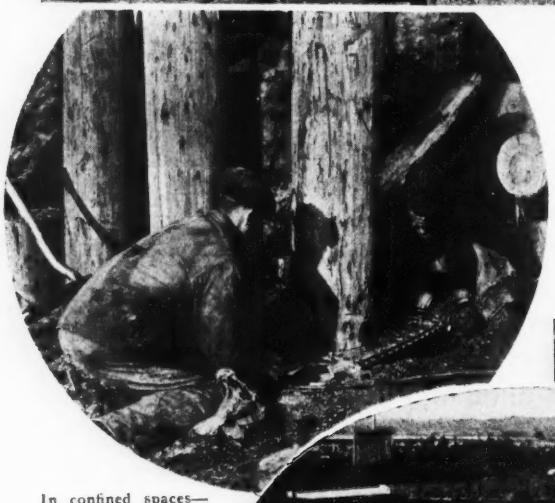
Space 284

at the National Railway Appliances Ass'n Exhibition, Coliseum, Chicago, March 4 to 7th, 1929.

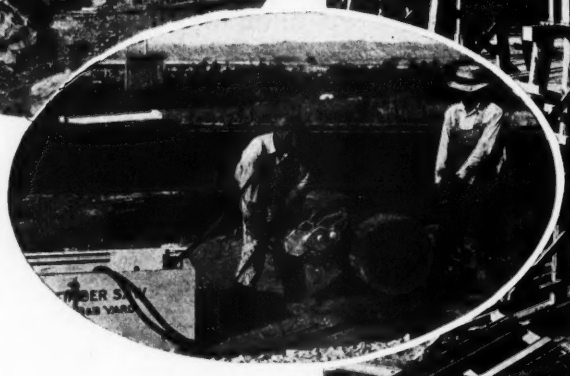
(Electric, AC or DC and Air Operated)

Successfully serving such roads as:

Southern Pacific, 4
Boston & Maine, 5
Chicago, Milwaukee, St. Paul & Pacific
Chicago & North Western
Chicago, Burlington & Quincy, 3
Union Pacific System, 2
Maine Central
New York Central & S. L.
Atchison, Topeka & Santa Fe
New York, New Haven & Hartford, 2
Ft. Worth & Denver, So. Plaines
New York Central, 2
Panhandle & Texas, Penna.



In confined spaces—C. & N. W. at Council Bluffs, Ia.



"50% saving in labor costs in cutting 12" to 14" Oregon Pine." L. E. Wissner, Bridge Supt. of the Southern Pacific.

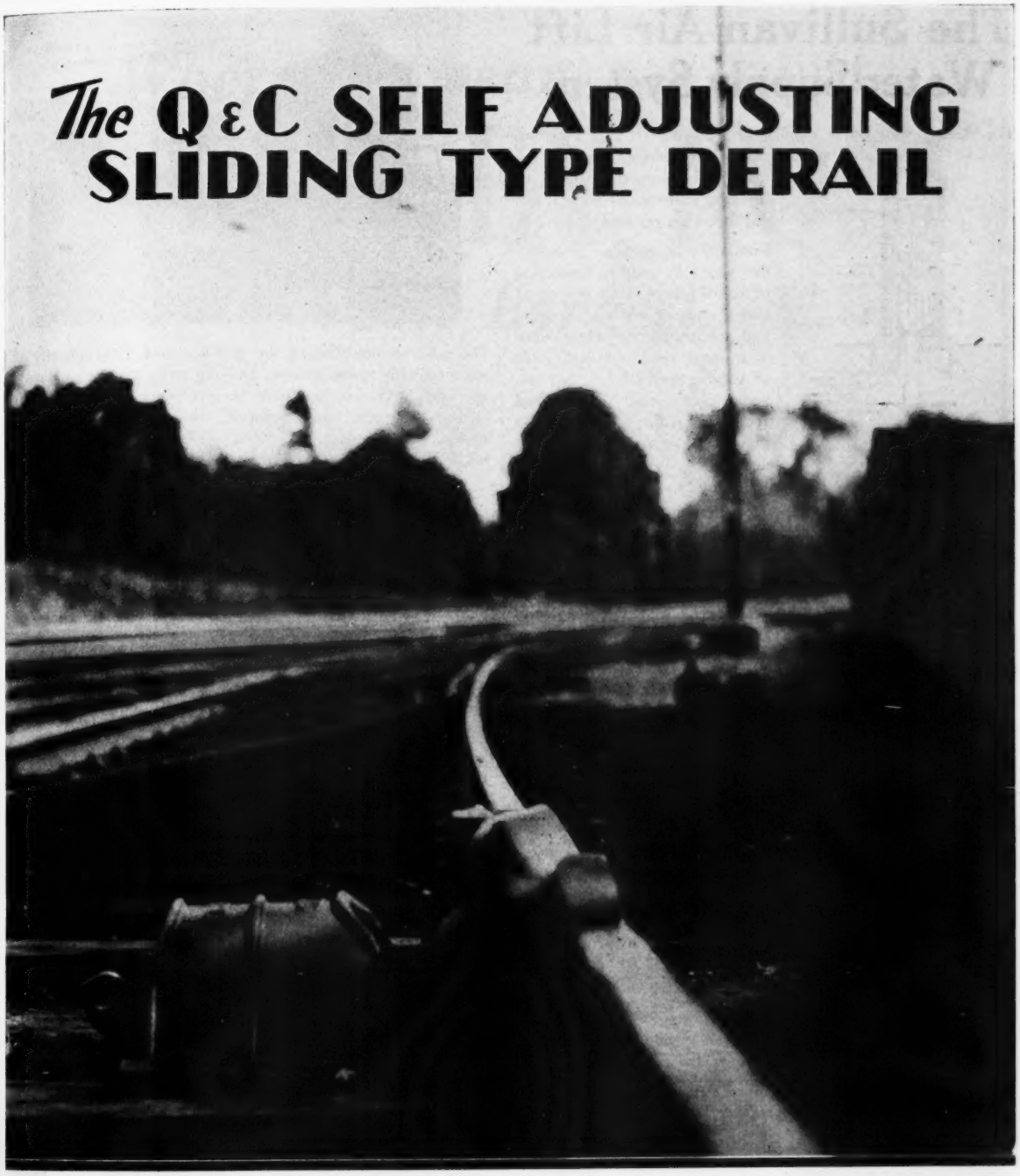
Over 230 installations in the R. R. Mining, Marine, General Construction and other fields.

Reed-Prentice Corporation

Worcester, Mass.

Branch Offices:
Detroit: 3-245 General Motors Bldg.
New York: 1508 Evening Post Bldg., 75 West St.
Chicago Agent: B. E. Hurlbut, Railway Exchange Bldg., Chicago

The Q&C SELF ADJUSTING SLIDING TYPE DERAIL



One Model Fits All Rail Sections

Here is a typical installation of the new Q & C Self Adjusting Sliding Type Derail—a derail offering new economy and efficiency to the railroads.

This one model automatically adjusts itself to all rail sections, permitting only one model being carried in stock. Base plates extend under the running rail, assuring a perfectly aligned block. The blocks and housings are interchangeable, and a block can be replaced without removing the housing from the track.

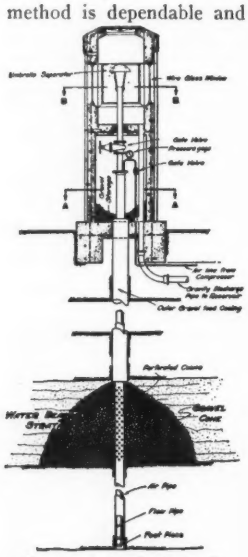
We will be glad to demonstrate the superiority of the Q&C Self Adjusting Sliding Type Derail on your railroad.

The Q & C Company, 90 West St. - New York - - - - Chicago - - - - St. Louis

Booths 120-139 March Convention

The Sullivan Air Lift Water Supply System

For railway well water supply, the Sullivan Air Lift pumping method is dependable and has many advantages, whether for main line locomotive supply or for shop or terminal service, for the following reasons:

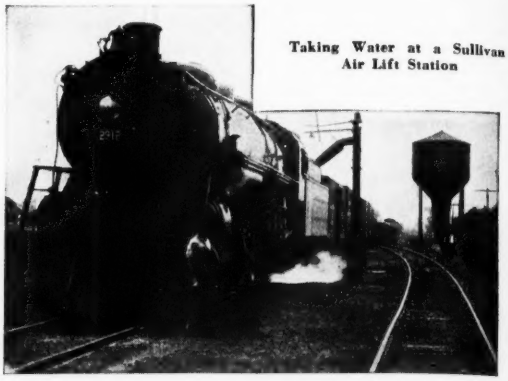


Detail of Air Made Well

There are no moving parts under water to require inspection or repair; there is no pulling of sucker rods or working barrels; and no trouble is experienced with sand, mud, crooked wells of varying water levels. A number of pumps may be controlled from one power plant. Fewer pumpers are needed with this dependable system.

Shallow Wells in Sand Strata

Sullivan Air Lift, and Air Made Wells offer the only method of securing dependable water supply from shallow sand strata.



Taking Water at a Sullivan Air Lift Station

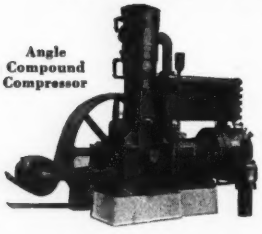
The sand accumulating in the well is removed periodically and replaced with coarse gravel; and the wells instead of slowing up, have a gradual tendency to give more water. At many points throughout the southwest, where mechanical pumping systems have failed, Air Made Wells have made the water supply permanent.

Automatic Air Lift

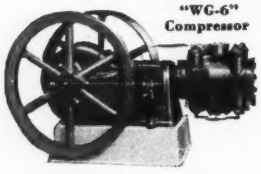
Automatic Sullivan Air Lift obviates the need of attendance in isolated stations. The installation consists of a Sullivan Compressor and an electric centrifugal pump, both of which are controlled automatically, by the level of the water in the tank.

Send for Catalogs 1971-I, and 1956-J

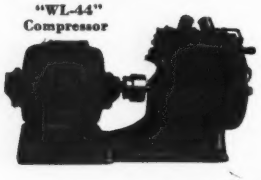
Sullivan Air Compressors



Angle Compound Compressor



"WG-6" Compressor



"WL-44" Compressor

Portable Compressor on Steel Wheels

For shop, or yard, or water station, a Sullivan compressor is available of size, type, and drive exactly suited to your needs. Angle Compound Compressors, due to unique balanced angle design, and multi-step control, effect economies in power and maintenance unavailable in other compressors. Capacities 313 to 5100 cu. ft.

Catalog 1983-J

Single stage horizontal, belt driven, and vertical direct-connected compressors are also available from 68 cu. ft. up.

Catalogs 1983-I, 1983-H

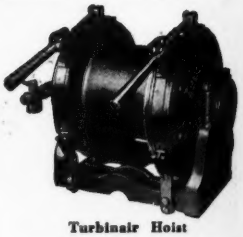
Portable air power is supplied economically by Vibrationless Compressors. They can be furnished in 103, 110, 160, 206, 220, and 310 cu. ft. models, on steel wheels, trailer trucks or skids, with gasoline engine or electric motor drive.

Catalog 1983-F

Sullivan Portable Hoists

For handling rails, unloading or loading cars in the yard, for car spotting, or for other odd-job hoisting and hauling tasks, Sullivan Portable Hoists are especially handy. 345-lb. models will lift a ton on single line, or pull a 50-ton car on level track. Air and Electric models available to 35 H.P.

Catalogs 1976F, 1976-G, and 1976-J



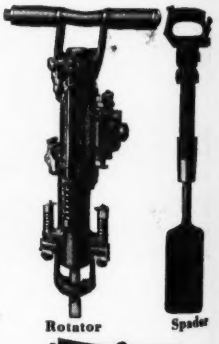
Turbinair Hoist

Sullivan Rock Drills, Concrete Breakers, Clay Spaders

For construction and outdoor maintenance requiring rock drilling, concrete breaking, or clay digging, Sullivan Air Tools will help you.

"Rotators," "Busters," and "Spaders" are rapid, powerful, convenient hammer drills. An outfit of these tools plus a portable compressor, will save much time and labor on any section.

Send for "Speed Up With Air"



Rotator Spader

Buster

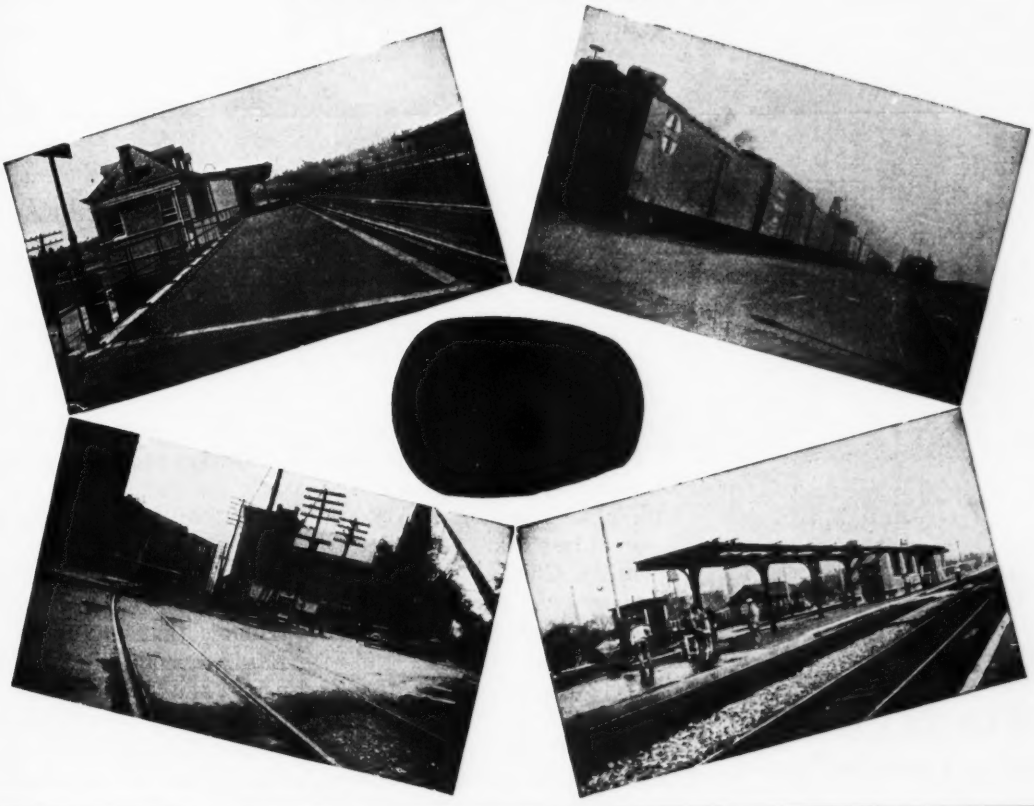
Sullivan Machinery Company
411 Peoples Gas Bldg., Chicago

SULLIVAN TRADE MARK

Where the wear is greatest

HEADLEY NO. 1

Wears Longest



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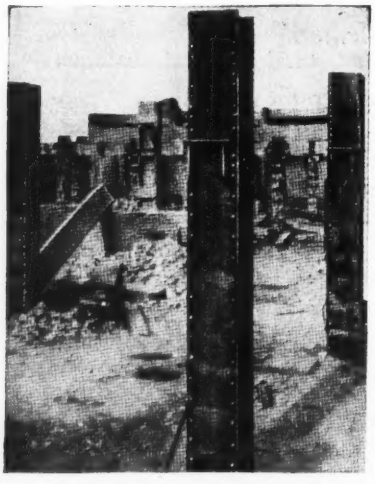

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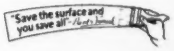

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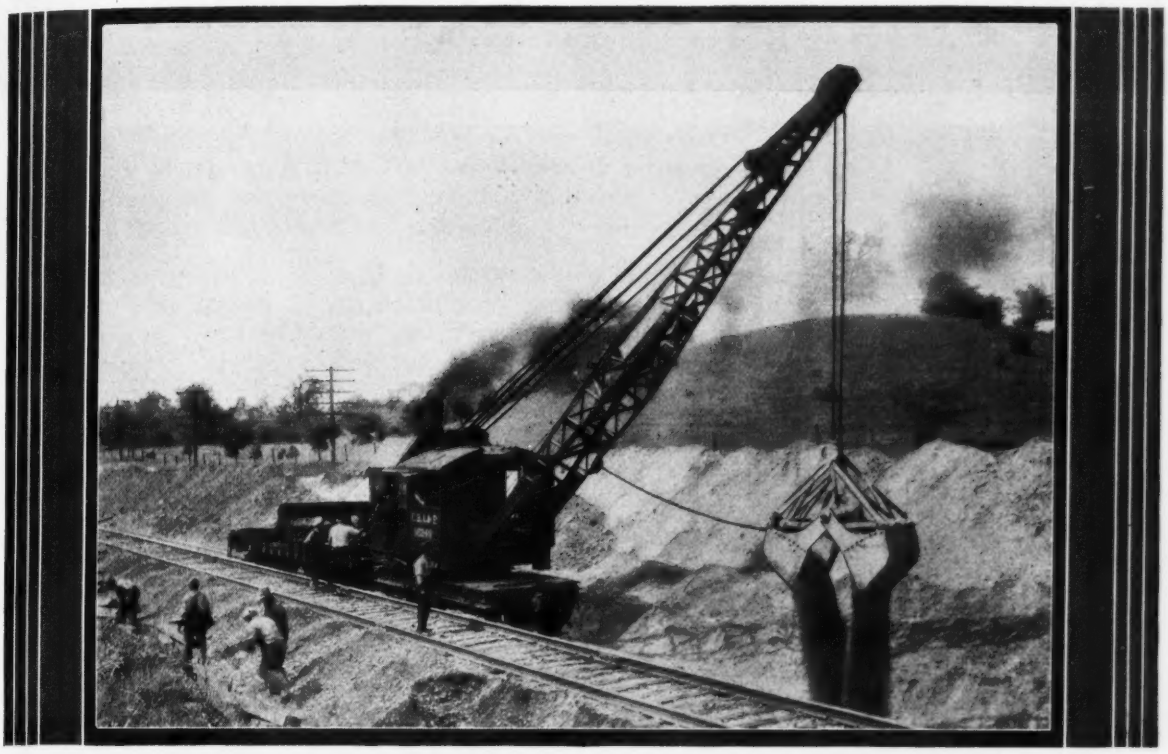

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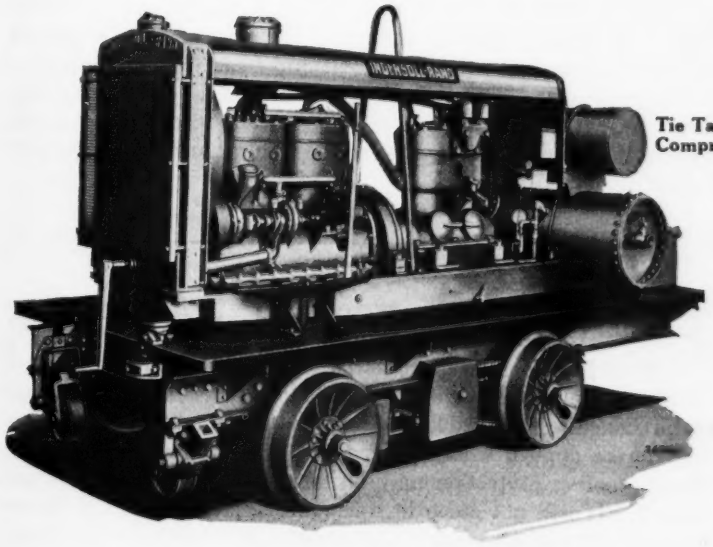

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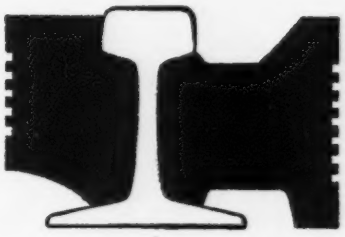

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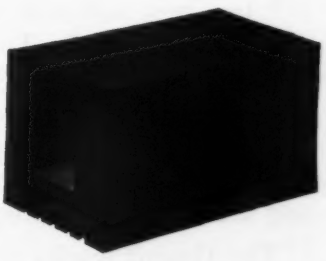

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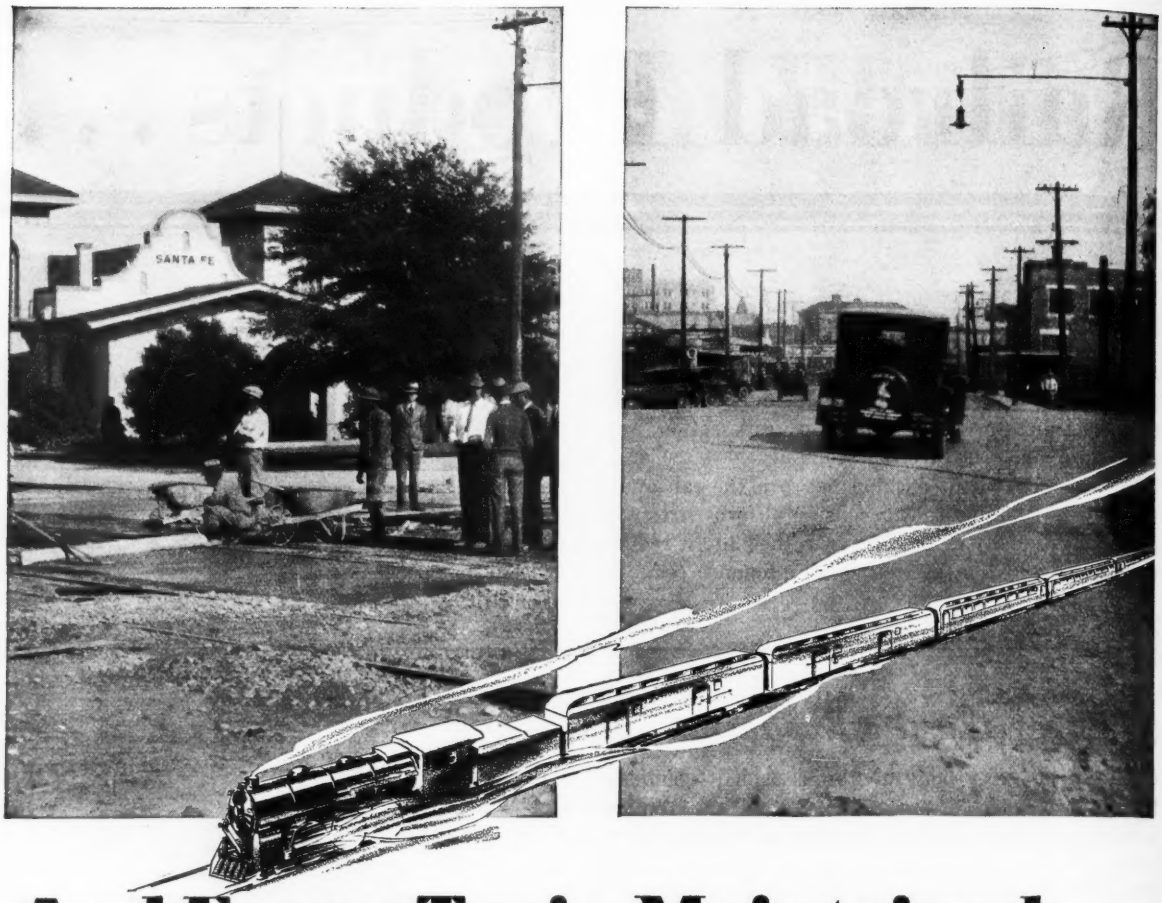
PRODUCTS



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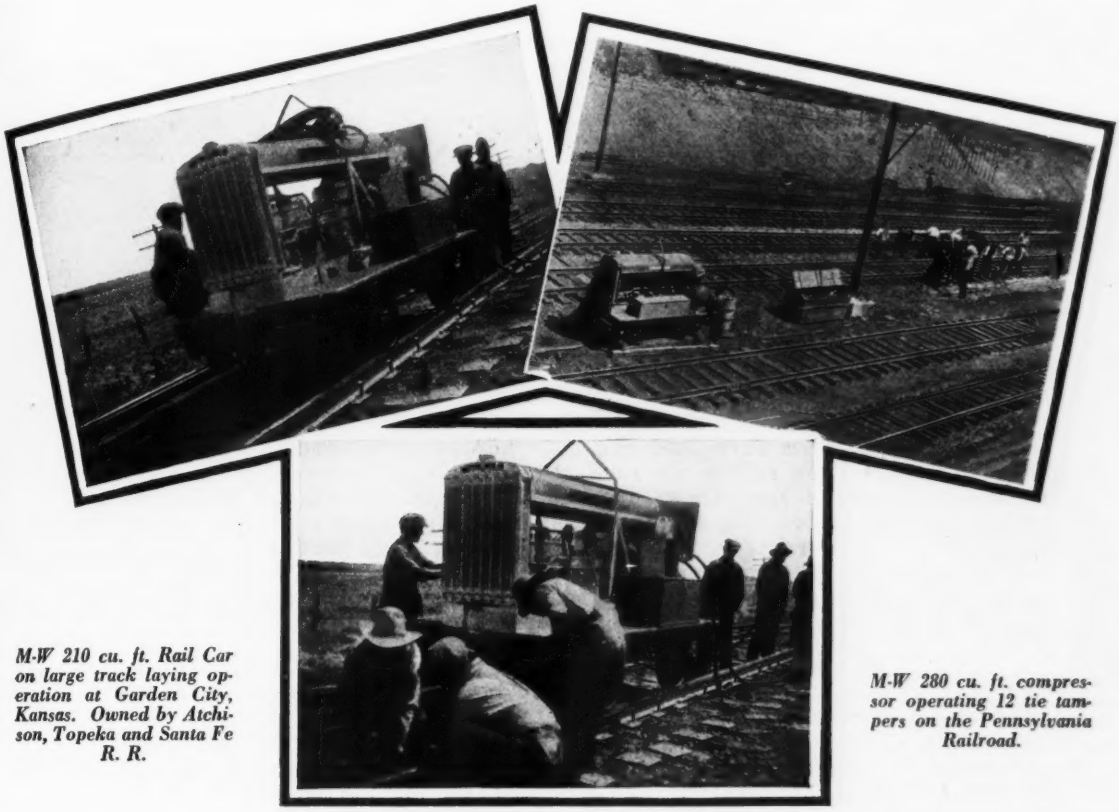

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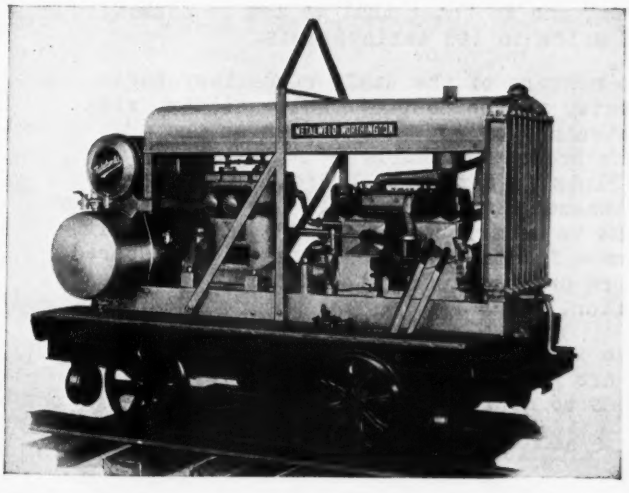
M-W 210 Rail Car on track maintenance for Chicago, Milwaukee and St. Paul R. R.



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February 28, 1929

Dear Reader:
Everywhere

As you have read Railway Engineering and Maintenance from month to month, I am sure that you have noticed the amount of space that we give to the work of the various railway associations. We do this because we believe that these organizations constitute one of the most effective forces for the development of more efficient railway practices. Composed as they are of railway men, who are giving freely of their time for the investigation of current problems, they provide a forum, in committee meetings and in conventions, for the exchange of information and of experience that cannot be other than helpful.

We are glad to do what we can to promote their interests and have always welcomed the opportunity to help. Take, for example, the American Railway Engineering Association, whose annual convention will be held in Chicago next week. We are proud of the part that our parent publication, the Railway Age, played in its organization. It is a matter of record that this outstanding organization had its inception in the mind of Harry P. Robinson, then editor of Railway Age, and that it was at his suggestion that a group of 17 prominent railway engineers met in Chicago on October 21, 1898, to take the initial step in the formation of what has grown into the A.R.E.A. Since that day, the Railway Age and Railway Engineering and Maintenance have endeavored to lend every possible aid to this organization, and we trust that we may be permitted to enjoy a reasonable spirit of pride in its achievements.

In like manner, the members of the staff of Railway Engineering and Maintenance co-operate, to the best of their ability, with other organizations in the maintenance of way field, such as the Roadmasters Association, and the Bridge and Building Association, as well as the local supervisors' clubs in New York, Buffalo and Chicago. In all of these organizations, the members of our staff are encouraged not only to take membership, but also to contribute of their time and their knowledge. Such work takes time - frequently when it can ill be spared. Yet we feel that such calls afford an opportunity to contribute to the progress of railway transportation.

In short, we believe in the work that these organizations are doing. Because of this, we are glad to do what we can to promote their interests and to encourage others to do likewise.

Yours very truly,

Elmer T. Howson

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Editor.

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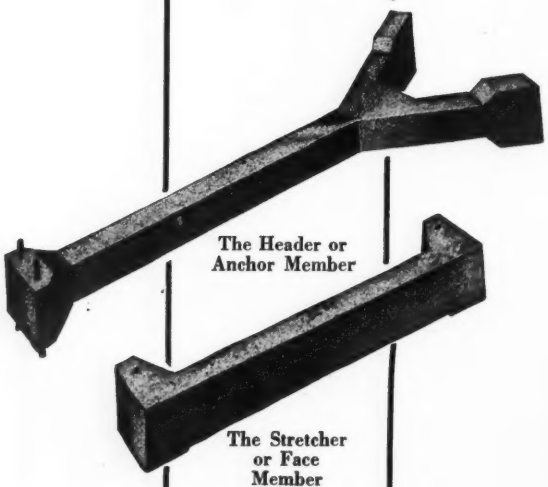

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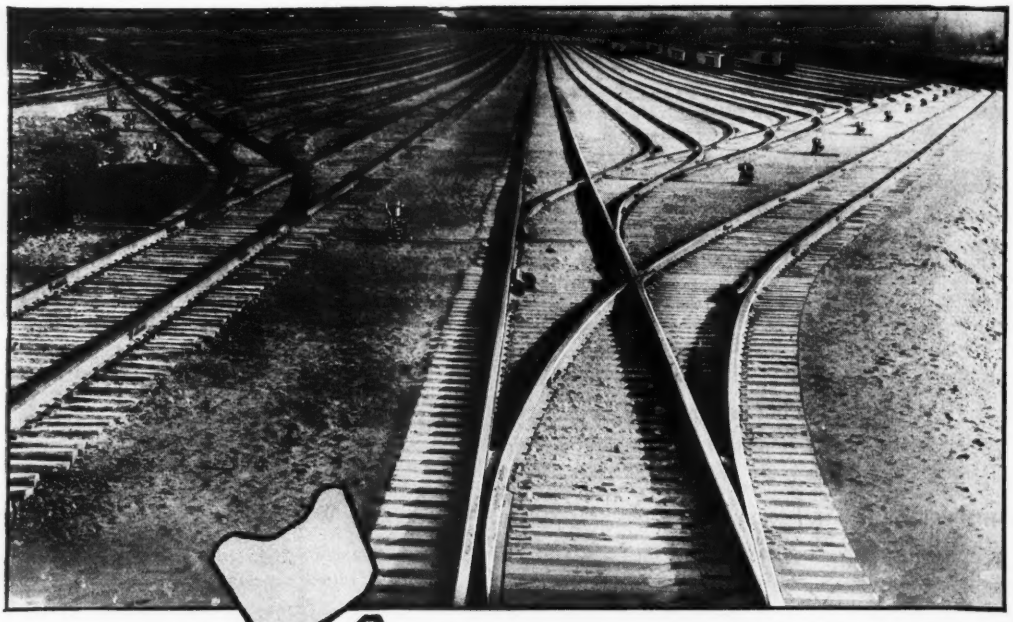

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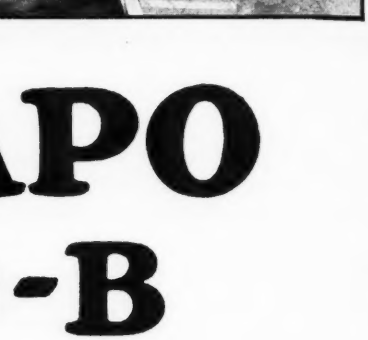

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Railway Engineering and Maintenance

Volume 25 March, 1929 No. 3

For Eleven Years

FOR THE eleventh consecutive year the March issue of *Railway Engineering and Maintenance* is devoted to the consideration of labor-saving equipment and its application to railway construction and maintenance work. Eleven years is not a long time; yet within this period the use of machines in routine operations has increased many fold. Instead of isolated devices used here and there and generally regarded with suspicion or indifference, many devices or units of equipment are now accepted almost universally and the variety of devices available has multiplied greatly.

The rapidity of this trend is reflected in no better way than by the motor car. It is less than 20 years ago that the first railway, a middle western road, considered the motor car of sufficient merit to warrant equipping an entire engine district with it, and as recently as 10 years ago the members of the Roadmasters' Association were still debating actively whether the motor car was preferable to the hand car. Yet today it is generally recognized as standard equipment for gangs whose duties require that they travel any appreciable distance. This development has come about in part with the perfection of the car to increase its reliability and eliminate other shortcomings, and even more as a result of the education of railway men as to its merits.

This is typical of the development of many other devices. The tie tamper, a more recent device, is now standard equipment for all gangs on some roads; it is supplied to certain gangs on others; and is regarded as experimental on still others.

Great as has been the progress of recent years, it is evident that only a start has been made. American inventive genius is now alive to the opportunities in a field that employs more than 400,000 men. Equally important, railway men are becoming mechanically minded—receptive to new machinery and willing to speed its development. We are now on the verge of a development in labor-saving equipment that will, in the next few years, far surpass anything that has occurred to date.

The Repair Problem

AS THE amount of machinery employed in the construction and maintenance of the tracks and structures has increased, a problem has arisen in keeping this equipment in repair. When only a few units were in service, no special facilities were necessary, for such work as was necessary could be done in the nearest mechanical department shop. As the number of units of equipment increased, however, the volume of repair work grew in proportion, and the demands on these shops reached a point where they made serious inroads on routine operations, with resulting dissatisfaction to the mechanical and engineering departments alike. The increase in the volume of this work has been so gradual, however, that the facilities, like Topsy, became seriously outgrown before this condition was fully appreciated.

As a result, there is today no uniformity of practice among the roads. On the contrary, there is the widest diversity in methods and with relatively few exceptions, the measures in effect are admittedly inadequate and inefficient. This condition points to the importance of a thorough study of the problem of equipment repair to determine the nature and extent of the facilities required for a given amount of equipment, the value of specialized attention at one or a limited number of points as compared with routine service in the more numerous local mechanical department shops, the extent and character of the field inspection and "first-aid" service, etc.

An encouraging development in this direction is a movement which has been initiated within recent weeks for the formation of an organization among the men responsible for the care and repair of work equipment. This organization, the suggestion for which has originated among men directly responsible for the maintenance of this equipment, will provide a medium for the interchange of experience that cannot be other than helpful. Confronted as these men already are with the maintenance of equipment costing hundreds of millions of dollars and with the possibility that this investment will be double within the next ten years, their task is an important one. The development of a medium for the full and free exchange of information between these men promises much of benefit to the railways.

As an Investment

WITHIN a relatively short period of time the expenditures made by the railways for labor-saving equipment have reached large sums until today it is estimated that the total investment exceeds $400,000,000. This amount is so large as to be beyond the conception of the average man. It is so large, also, that railway managements must consider it from the standpoint of an investment.

The money expended for equipment must be secured in the same way that funds are obtained for other railway improvements—from the sale of securities to the public, on which a return must be paid in the form of interest or dividends. Such an investment must, therefore, yield a return equal to and in fact greater than that to be paid the public if the original purchase is to be justified and further orders warranted. This requires that each individual unit

of equipment must not only *be able to* demonstrate its ability to return a profit but that it must actually *do* this in day-to-day operations. This places on the department, the supervisor, and the foreman to whom the equipment is assigned, a responsibility that is all too lightly borne in many instances.

Because of the remoteness of the connection between the men who request and who use equipment and those who pay for it, this aspect of the problem is commonly overlooked. A machine is furnished a gang and it is used or not as convenience prompts, without thought of the interest charge that accrues daily or the even greater loss that results from failure to secure the greatest economies possible from the machine. Delays due to failure to receive repair parts or other necessary supplies or because of poorly co-ordinated programs, give little concern. Likewise the extent to which output can be increased by the reorganization of a gang to adapt it to machine methods is overlooked. In numerous other ways the full return possible is lost because of neglect in one way or another.

The amount of equipment on a road, on a subdivision, or for an individual gang is now sufficient to constitute a real plant. The chief engineer, the roadmaster and the foreman are in charge of this plant on their respective territories and the management has a right to expect them to secure a return from it just as directly as if this machinery was employed to produce radios or automobiles. Insofar as this plant is concerned, each of them is the manager of a business for his road, and it is his duty to earn the largest possible return from the investment which his road has made in equipment for his use.

More Supervision Needed

THE USE of labor-saving equipment has developed so rapidly that it is not surprising that the railways have not kept pace with it in all respects. In no one direction are they more deficient today than in providing adequate supervision of this equipment to insure that it will be used most advantageously. They have spent and are spending freely for devices of demonstrated merit. They are maintaining them to fairly high standards. On most roads, however, the machines are falling considerably short of their maximum possibilities, because of the manner in which they are employed. All too frequently they are turned over to local division officers with little or no follow-up. These officers in turn pass the equipment on to their supervisors who assign it to their foremen. Somewhere in this chain there may be a man who is indifferent to the machine, with the result that, if not checked, he is likely to use it inefficiently or not at all.

On some roads the work equipment has been placed under the supervision of one man. Too often, however, his responsibility is confined largely, if not entirely, to its repair, and its operation is left to the local man. This is not sufficient. The amount of money that is invested in equipment of this character on the average road is now large enough to demand the concentration of responsibility in one man for the care and operation of such equipment in all of its various phases. Such a man should not only be required to know that the equipment is properly maintained, but also that it is used as constantly as conditions will reasonably permit and in the manner that is most productive of results. All too frequently needless delay in securing repair parts, faulty programming of work or sheer neglect result in a machine remaining idle without this delay becoming known, because it is the duty of no one man to follow each unit from day to day.

No organization will long run itself. Just as truly, no expenditure for work equipment will justify itself fully without constant supervision. Few opportunities offer greater possibilities for economy in maintenance of way service today than the more intensive supervision of equipment. It can no longer be regarded as a part-time task.

From the Standpoint of the Men

IN considering the increasing use of labor-saving equipment, a railway management must of necessity approach the subject from the standpoint of the economy which can be effected through its use. There are, however, other and equally important considerations for the men who are to use this equipment. The first and most direct effect is the reduction in the amount of physical exertion required for the performance of a specific task. The extent to which machinery has already taken the drudgery out of the work of the maintenance man is seldom appreciated. No sane man would willingly return to the hand car today. Likewise, the track liner, the tie tamper and the concrete mixer have eliminated back breaking tasks of a decade or two ago, while the spike driver and the adzing machine are typical of new devices which accomplish similar purposes. In short, maintenance of way work is rapidly becoming that of skilled mechanics and the old adage that the first essential of a track man is "a strong back" no longer prevails with the force that it once had.

From the standpoint of the employee, labor-saving equipment offers attractive possibilities in still another direction. Not only is the work becoming less laborious but the use of equipment increases the output of each man and, over a period of time, is making it possible to pay him higher wages. This is not a development which comes quickly; rather its effect becomes evident only as the use of equipment becomes universal. In those industries in which machinery has made the greatest progress, it can be shown that the employees are most highly paid and that their earnings have risen in general in fairly close accord with the adoption of machinery throughout that industry. There is no reason to believe that any other result will occur on the railways. In other words, the men who use labor-saving equipment have as keen and as direct an interest as the managements in extending its use.

The Effect on Gang Organization

IN THOSE industries in which the greatest use has been made of labor-saving facilities of one kind or another, there has been a most complete reorganization of methods of working to permit the maximum benefits to be secured from the equipment. In the utilization of labor-saving devices on the railways, however, we are only now beginning to consider changes of this character.

Until recently, the equipment that has been accepted has been employed more or less individually to perform specific tasks. We are now entering a period, however, when several different devices are being employed on a common task, as for instance, relaying rail, where, in addition to the actual handling of the rail, the spikes are being pulled and later redriven, the ties are being adzed, the bolts

run up and the rails drilled for bonding by different units of equipment. The investment in a complete outfit for such a project runs into a sum sufficient to make it necessary for a road to secure the maximum return from it. This is leading a few of the more progressive roads to reorganize their group for work around such machines. Similar attention is also now beginning to be given to the reorganization of section gangs to accomplish the same results. The doubling up of sections is one expedient, the allocating of equipment to two adjoining sections is another. Still another and more drastic reorganization, which at first thought has much to commend it, is described on page 125. Such plans are indicative of the growing appreciation of the fact that changes of far reaching importance may be made in the maintenance of way organization in the near future. The changes that have been made to date reflect the thought of not a few maintenance men that new conditions, brought about by the increasing use of equipment, require a fresh approach to the problems of maintenance.

The Service Man

BEFORE a labor-saving device is entitled to acceptance by the railways it must demonstrate to their satisfaction that its adoption will be advantageous to them in reducing the cost of work, increasing output, or effecting other improvements. Having done this, it is to the interest of the railways to adopt the device and to use it in the way that will be most beneficial. Because of this fact, it is reasonable to ask why it should be necessary for the manufacturer of such a device to employ men to go from road to road and from gang to gang, training the employees of the railway to use the device in a manner that will save the roads the most money. Obviously the cost of such service must be added to the selling price of the device, for the manufacturer derives his income solely from the sale of his product. Yet those manufacturers who have made the greatest success in establishing their device on the railways have, as a rule, been most active in "servicing" their equipment. They have provided this service because of their experience with conditions that prevail on the railways, which are justifiable in part and an indication of shortcomings as well.

If a device is new to a road, it is essential that the operators be given some training if they are to employ it most advantageously. Likewise it is important that the equipment receive expert attention in its maintenance. More important, however, from the standpoint of the manufacturer is the fact that the natural inclination of a man is to follow established habits and his normal inclination is to oppose new ideas. The introduction of most classes of new equipment calls for more or less drastic changes in working methods, and few men are willing to change their methods quickly. As a result, it is necessary for a new device to overcome this natural conservatism before it can be said to be safely established. A service man is essential to guide a new device through this critical period.

There is another phase of this problem, however, which is not quite so obvious. It arises where a device has become so well established on one part of a system as to require no further demonstrations of its merit. Here it is of evident self-interest to a road to extend its use as fully as possible and to supervise this extension of its application in order to enlarge the economy. Yet the alert manufacturer finds the need of a service man equally necessary here and he usually goes to the expense of repeating on this newer territory the work of education that he had done on the earlier division. This would appear, on the surface, to involve expense by the manufacturer for service that the railway should be able to supply at least equally as well and more cheaply. In practice, however, this does not prove out. Because of the diversity of the demands on the average railway officer, regardless of rank, he can give only a limited amount of attention to any one device and it suffers accordingly. It is for this reason that the manufacturer finds that it is good business to render this service. Because of the shortcomings within their own organizations, the railways are also the beneficiaries of this service. The manufacturers' service man, whose sole function is to make a success of a single machine, should, therefore, be welcomed on any railway he desires to serve to the mutual advantage of both the seller and the user.

Photograph by W. N. Jennings

Pennsylvania Bridge Over the Schuykill River at Phoenixville, Pa.

The earning power of a mowing machine is limited to 90 days

Labor-Saving Must *To Pay*

Power tools and other facilities must earn an adequate return on the investment made

By C. R. KNOWLES
Superintendent Water Service, Illinois Central System*

THE PRIMARY object in using labor-saving equipment is to effect a reduction in the expense of doing work. Second only in importance to the saving effected is the fact that such equipment improves the quality of the work, as it is generally recognized that, within certain limits, modern labor-saving equipment will produce better results than hand methods. In some instances, as for example in welding, it is also possible to do work mechanically that cannot be done in any other way.

Few, if any, roads that have adopted power methods of doing maintenance of way work are willing to go back to the old hand methods; yet it is a fact to be regretted that in some instances the power equipment available for work is employed so inefficiently that the benefits derived from its use are exceedingly small. It is even possible that this neglect may be carried so far that the railroad is actually losing money by owning such equipment, as it must always be borne in mind that it costs money to own labor-saving equipment, whether it be used or not.

An Adequate Return Is Essential

It is generally conceded that expenditures for labor-saving equipment *can* be justified by lower costs and more effective work, provided always that the proper machine has been selected for the particular work and that it is properly operated and maintained. There is a question, however, whether the railroads are getting all that they should from the use of such equipment, as its purchase has increased to such an extent in the last few years that it is not at all certain that the roads have in all cases been prepared to provide for its proper operation and maintenance, and, of equal importance, to schedule the work for the equipment in such a manner as to get the maximum service and benefits from its use.

*Mr. Knowles is also in charge of the maintenance and operation of labor-saving equipment on his road.

No figures are available as to the total investment in equipment for maintenance of way work, but if the remainder of the railroads of the country are only half as well equipped as the New York Central lines east of Buffalo, the total investment is more than $400,000,000. This figure is being increased each year as the use of such equipment is extended and new devices are developed and placed on the market. Interstate Commerce Commission reports show that in 1927, a total of $10,619,036 was expended for roadway machines, $7,104,384 of which was charged to operation, and $3,514,652 to additions and betterments.

A Liability or An Asset

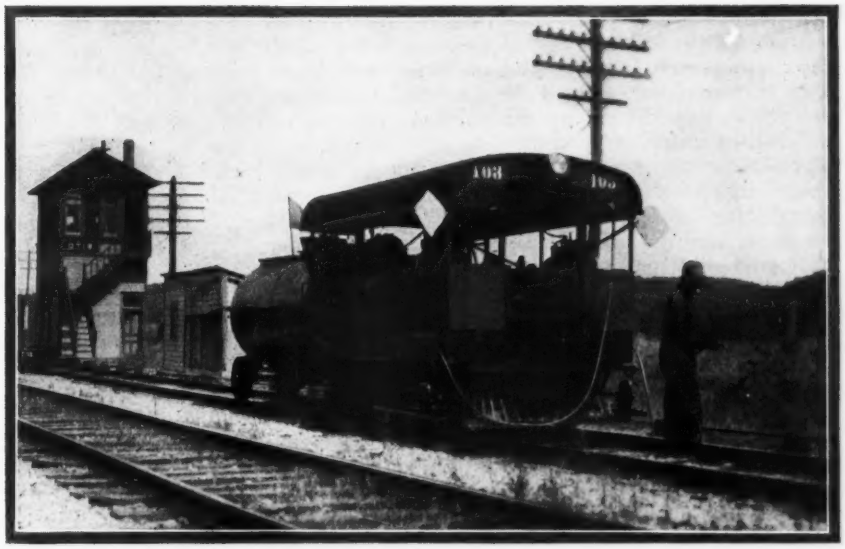
Regardless of how effective a machine may be, it must be kept at work if the desired results are to be obtained. Every unit of labor-saving equipment represents a certain investment, and until it has been used a certain length of time it is a liability. The period that it must be used to convert it into an asset is determined by the interest and depreciation on the first cost plus the cost of maintenance, divided by the daily saving, the result representing the number of days that it must be operated in order to pay carrying charges.

The following table shows the number of days that a few commonly-used labor-saving machines must be used to pay their carrying charges, operating costs not being included:

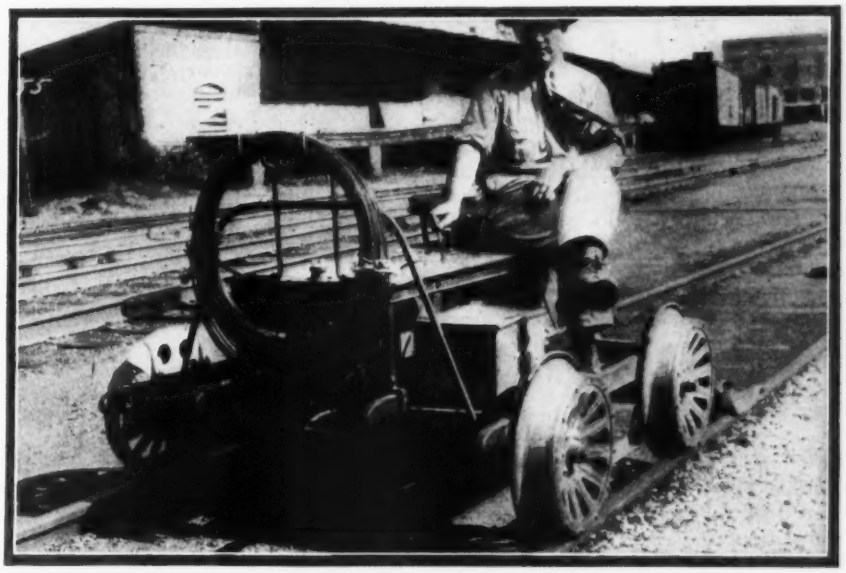
Kind of Machine	First cost	Estimated life, years	Estimated carrying charges	Days per year machine must work to pay carrying charges
Rail laying crane	$6,600	10	$1,300	20
Rail oiling machine	6,000	10	1,100	27
Tie tamper	2,600	10	500	40
Ballast discer	800	10	200	15
Mowing machine	1,000	10	300	25
Motor car	250	10	88	70

The maximum time that any machine may be used in any one year is, of course, 365 days; deducting

Equipment Work *Its Way*



It costs $100 a month just to own this track oiler



A motor car must work 70 days a year "to earn its keep"

Sundays and holidays we have 300 days. This figure is further reduced where the machine is used on seasonal work, as for example, a mowing machine. The effective use of such a machine is usually confined to a period of approximately 90 days, leaving 210 working days that it must remain idle. It is, therefore, essential that if the desired maximum return from the investment is to be obtained in cutting weeds, the mowing machine must be ready for service promptly at the beginning of the mowing season and must be kept in operation during the comparatively short period that it can be used. Assuming that the difference between the cost of cutting weeds by hand and with the machine is $12 per day, the maximum earning power of the mowing machine is $1,080 per year, less the carrying charges, which we may assume are $300, leaving a net capacity of $780. It is, therefore, apparent that this machine must be operated at least 25 days to break even. On this basis, there are left only 65 days in which the machine can show any actual saving.

The Case of the Track Oiler

Another example of the cost of owning work equipment and the loss that may be incurred by delays is that of a track oiling machine. Such a machine represents an initial cost of $6,000. The interest, depreciation and maintenance charges approximate $1,100 per year. A regular operator is required for at least nine months (the length of time that the machine can be used in a year) at a monthly salary of $150. Thus, the daily expense is in excess of $10, even when the equipment is idle. In checking the operation of one of these oilers, it was found that the avoidable delays amounted to a total of 40 days in one season, which included 25 days waiting for oil (10 of which

resulted from improper oil being furnished), 10 days waiting on repairs that should have been completed in 24 hours, and 5 days unloading the machine from the car on which it was shipped. The earning power of one of these machines, depending upon whether it is used for oiling joints only or for the entire rail, is from $30 to $50 per day. Thus this delay of 40 days represented a loss of at least $1,600 that could have been avoided easily if the oiler had been given the proper supervision by the various divisions on which it operated.

A $250 section motor car does not appear to represent much of an investment, but the carrying charges for interest and depreciation alone are 12½ cents per day or $37.50 per year. Adding $50 per year for maintenance brings the cost of owning one of these cars for a year to $87.50. Assuming that the average net daily earning power after deducting operating costs is $1.25, it requires 70 days' use each year before an actual saving is effected through its use. While there is no doubt that, in the aggregate, motor cars are among the most valuable of labor-saving devices it is not at all difficult to find many examples of cars being carried in the equipment list at a loss. The total investment in motor cars is estimated at $12,000,000, and a conservative estimate of the cars out of service for other than repairs is 5 per cent, representing an idle investment of $600,000.

Versatility Can Be Overdone

Versatility is a very desirable attribute in any unit of work equipment, as its ability to do more than one kind of work broadens its sphere of usefulness and avoids the necessity for tying it up when a particular type of job is finished. On the other hand, there is a danger of reducing the efficiency of a machine through using it to do work that a cheaper machine can do, or to do too many things at one time. When a number of different functions are incorporated in one machine, it is sometimes difficult to synchronize the work so that all of the different operations can be carried out simultaneously. For example, with a rail-laying crane, it is essential that it be equipped with power wrenches and perhaps with a drill, as the use of a power wrench will reduce the number of men required to handle bolts in track laying from 8 or 10 to 2 or 3 and the drill may in some cases avoid delays. However, when, in addition to the wrenches and drill, the machine is equipped with a power saw, tie tampers and perhaps other tools, there arises the danger of slowing up the work of laying rail, the purpose for which the machine was primarily designed and purchased.

The abuse of work equipment through failure to care for it properly when it is not in use, materially affects the efficiency and life of the equipment and reduces the possibility of its earning an adequate return on the investment. Idle equipment deteriorates more rapidly than when in use, unless it is properly cared for. Storing equipment in the open or exposing it to the weather for any length of time is extremely poor practice in any part of the country, regardless of weather conditions, for this will invariably reduce its efficiency and shorten its life.

Considerable attention is being given the shopping of work equipment for general repairs, and while there is some difference of opinion as to whether this work should be done by the mechanical department or in regularly established maintenance of way shops, the number of the latter is constantly increasing, and marked progress is being made in providing for proper shop repairs.

It is to be regretted, however, that the same progress is not being made in keeping the equipment out of the shop, or in other words, in the prevention of abuses in operation which invariably result in excessive maintenance costs and greatly reduced time between shoppings. This is particularly true of motor cars, for which an annual maintenance cost amounting to from 25 to 30 per cent of the first cost of the car is the rule rather than the exception. This excessive cost can be accounted for only by reason of improper operation, due largely to carelessness and neglect in operation.

The Causes for Loss of Efficiency

In preparing a budget for the purchase of labor-saving equipment it is not at all difficult to produce figures showing savings as compared with hand labor, but the results in actual practice sometimes fall short of expectations. A careful analysis of operating conditions will probably disclose the cause for such a discrepancy as the following:

(1) Improper selection or application of equipment
(2) Failure to schedule its use properly
(3) Inertia or opposition to its use
(4) Poor operation and field maintenance

The last named is perhaps the most serious condition of all to contend with and brings up the problem of the selection and training of the operator in order that the maximum return may be secured from the investment in equipment. Field maintenance cannot be divorced from operation as it is vital to continuity of operation. Too often, delays occur on account of breakdowns resulting from the incompetence or carelessness of the operator. While repairs are sometimes delayed through lack of initiative, or in more rare cases to indolence, it is not alone the cost of making repairs, but in many cases the much greater expense involved where the activity and efficiency of a large gang of men is affected by the delay, which increases the expenditures for the work.

The Saturation Point Must Be Watched

The saturation point of work equipment must be watched very closely as there is danger of accumulating more equipment than can be used to advantage, with the result that some of it must remain idle. Distribution is an important factor in this connection, for while the saturation point may not be reached on the railroad as a whole, there may be a congestion of equipment on certain divisions that results in some of it lying idle when it is needed on other parts of the road. The same thing is true of what, for want of a better term, may be termed "seasonal saturation." The northern lines of a railroad may be fully equipped with work equipment that is used only a portion of the year while other parts of the road, so located that work may be done during the winter months, may be short of equipment. In such a case the scheduling of equipment should be so arranged that wherever possible it can be used throughout the year.

An excess of equipment of a certain type also means the tying up of capital that might better be invested in other equipment. This is always an important factor, as the total amount of money that is available for the purchase of work equipment is limited, and a careful selection is essential to insure a fair return on the investment. It is also well to consider the question of obsolescence. Work equip-

ment is constantly being improved and it is better to wear it out through constant service than to be compelled to retire it before it has reached the end of its useful life because it cannot compete with newer and more efficient machines.

Programming Will Extend Season

Seasonable work equipment, such as track oilers, weed mowers, rail cranes and other similar machinery, as a rule, is used only for a comparatively small portion of the time on most railroads. Many roads, however, serve sections of the country with such differing climate that work can be done on some parts of the road at all times of the year. A careful programming of seasonable work equipment, giving proper consideration to weather conditions on various parts of the line, will greatly increase the earning power of these machines by simply increasing the time they are in use.

Portable paint-spraying outfits have been furnished to paint gangs on a number of railroads. It has been noted, however, that in some instances the use of this equipment is neglected in favor of the paint pot and brush. Instances have been noted where paint-spray compressor cars have been used by gangs to go to painting jobs and on arrival the gangs have then used only hand brushes. It is obvious that hand methods of painting will not pay the overhead on paint-spraying outfits.

Motor cars, particularly of the light inspection type, are often tied up for weeks—even months—without being used, while officers and others to whom they are assigned use trains instead. Where this practice prevails it may be possible to reduce the number of cars and reduce the investment in motor cars, and thereby increase their use by providing only one car for two or more men, rather than assigning a car to each individual.

It is often the practice to assign such equipment as discers, mowing machines, weed burners and similar devices to one division. This sometimes results in the equipment standing idle when it is badly needed on an adjoining division. The method of assigning such equipment is governed very largely by precedent, but it would appear that, in some instances at least, revised methods are in order. Why not follow the practice of assigning this equipment to a grand division or perhaps, in some instances, to the system?

Can not a ballast discer be used to mark or lay out a hand-laid ballast line? This would appear to be more economical than using boards or strings and at the same time would extend the use of the discer. Can not the use of a heavy ballast discer be increased by equipping it with a scraper for spreading and smoothing cinder and washed gravel ballast as well as for cleaning ditches? This work can either be done at the time that the discing operation is carried on or after the discing season, and the suggestion is offered with the thought that it will extend the period of usefulness of one of these machines beyond the usual discing season.

Delays Awaiting Repairs Can Be Reduced

Motor cars and other work equipment are often tied up unnecessarily awaiting repairs. This is frequently due to delays in the receipt of repair parts. An adequate stock of repair parts is essential to avoid delays to work equipment. There is danger, however, of accumulating excess stocks unless the stocks are carefully and frequently checked. Stock lists of repair parts should be prepared by a competent mechanic, fully acquainted with the operation and maintenance of the equipment. In this connection, the operator of work equipment must be alive to the necessity of using every means possible to procure repair parts in the event of a breakdown. This applies also to the local officers. Too often a machine is tied up while a requisition follows the usual routine, instead of being handled by wire or telephone.

Another common source of inefficiency in the use of work equipment lies in failure to maintain definite schedules when transferring units from one division to another. The first division sometimes holds equipment beyond the prescribed time, to do work not included in the regular schedule, or for some other reason. As a result, the second division is thrown off schedule and when the equipment is received it is necessary to hold it out of service until the original plans can be revised.

In many cases operators of work equipment are imbued with the idea that their only responsibility is to run the machine. This leads to the impression that the machine is infallible or that repairs should be handled by the manufacturers. Too often work equipment, particularly a motor car, is out of service because of some trivial matter; not infrequently a manufacturer's service man is summoned to adjust a spark coil or clean a spark plug.

It is sometimes found that equipment requiring a train crew or pilot is delayed while waiting for the crew. This is invariably due to failure to notify the transportation department in sufficient time to permit of having a crew on the job when required. This is particularly true when a temporary interruption to the operation of machine due to the necessity for repairs, or some other condition, has led to the release of the pilot or train crew. This occurs when the operator of equipment, believing it impossible to have a machine in service the following day, does not arrange to have the crew called and finds later that the machine can be used the next day but cannot work because he has no pilot.

Office Forces Can Aid

The delays to work equipment do not rest altogether on the operators and field forces but extend also to clerical forces, as, for example, in the handling of supplies and material for these machines. This is particularly true of oil. There have been many instances of weed burners and other oil burning machines standing idle for several days waiting for oil supplies, the delay in many cases being due to the clerical force. It is, of course, true that in many cases the operator has not adhered to his proper schedule or has failed to report anticipated changes in his schedule.

Power companies offer special concessions in the form of reduced rates for off-peak loads as they recognize the fact that they must maintain a fairly continuous load in order to realize the maximum return on their investment. The same principle should apply to the ownership of work equipment. Those who are charged with its operation and maintenance, as well as their supervisory officers, should be impressed with the amount of money invested and the importance of keeping the equipment in continuous use so that the maximum return may be obtained, not only in more effective work and better results but in increasing the return on the money invested in this equipment.

The First Requirement—in

THE FIRST requirement of any unit of labor-saving equipment is that it shall be ready for use when needed, whether it be seasonal equipment such as a weed mower, or all-year-round equipment such as a motor car. With the increasing investment in equipment, rule-of-thumb, makeshift methods for its maintenance no longer suffice. This has given rise to such questions as (1) the advisability of maintaining this equipment in the regular mechanical department shops or in maintenance of way shops equipped especially for this purpose; (2) the wisdom of concentrating this work in a system shop at some central location or distributing it in district or division shops; (3) the development of a method for stocking and distributing spare or repair parts to avoid delays awaiting parts, without tying up an excessive amount of money in spare parts. These questions are solved in different ways on various roads.

On the Minneapolis, St. Paul & Sault Ste. Marie, all labor-saving equipment is maintained in shops under the jurisdiction of the mechanical department and is operated under the joint supervision of transportation, mechanical and maintenance of way officers. On the Missouri-Kansas-Texas such roadway equipment as motor cars, weed burners and tie tampers are maintained in a special maintenance of way motor car shop, while steam shovels, pile drivers, ditchers, and other heavier equipment are maintained in the regular locomotive and car shops. In contrast with this method, the B. & O. concentrates its heavier repairs to work equipment in a special shop operated by the maintenance of way department, while making running repairs in the various division mechanical shops. Still further concentration of the repair of maintenance of way work equipment in shops under the jurisdiction of that department is found on the Big Four, where all equipment other than that requiring boiler work is maintained at central shops under the jurisdiction of the maintenance of way department.

The systems in effect on these roads are described and contrasted respectively by J. B. Kelly, general roadmaster of the Soo Line, K. H. Hanger, engineer maintenance of way, Missouri-Kansas-Texas, Earl Stimson, chief engineer maintenance, Baltimore & Ohio, and Paul Hamilton, assistant chief engineer, Big Four.

A View in the Soo Line Motor-Car Shop

Working Through the Existing Organization

By J. B. Kelly

General Roadmaster, Minneapolis, St. Paul & Sault Ste. Marie, Minneapolis, Minn.

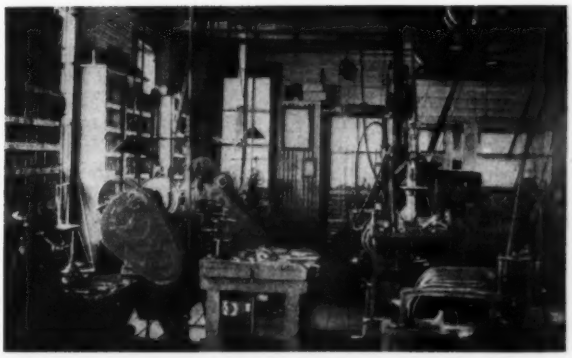
IN DEALING with the growing problem of handling and maintaining roadway equipment and roadway machinery, the Soo line is meeting the situation with a plan that gives the equipment the benefit of knowledge and experience from every angle, by dividing the responsibility for it among the departments—the operating department, through the general superintendents and the general superintendent of transportation; the mechanical department, with the mechanical superintendent and the heads of all his departments; and the engineering department. Each of these departments has such a large share in the actual performance that it does not seem best to centralize responsibility any closer for the operation of such an important phase of railroading.

Handling Roadway Equipment

The mechanical department is informed of the requirements well in advance of the opening of the season and prepares a program for the conditioning of such steam and gas shovels, etc., as will be required. Likewise, the engineering department, through the bridge and building forces, conditions

Keeping Equipment Good Condition

Machines must be ready to work when needed—An adequate organization to make repairs essential



Tool Equipment in Soo Line Motor-Car Shop

and fits up the gang cars, etc., while the general superintendent of transportation follows the equipment to the several jobs on the line, supplying and distributing ballast cars, spreaders, ditchers, etc. In the winter season this department is in daily touch with some 60 units of snow fighting equipment, each unit of which has a home headquarters, although the snowfall or severity of the winter will cause some shifting of it.

There are about 800 roadway machines equipped with gas engines in operation on the system, for which maintenance is provided through the repair and replacement of parts to both engines and cars in the field, while the rebuilding and heavy repair work is done at two advantageously-located locomotive machine shop terminals. The gas-engine shops are of special construction, with modern machinery and devices for conducting any kind of gas-engine construction or rebuilding necessary. They are operated directly under the machine shop foremen, each of whom has a gas-engine foreman and a force of about six mechanics who confine their attention entirely to that line of work. The gas-engine shop at Shoreham (Minneapolis) has a capacity for making heavy repairs to about 25 cars per month and the work is done to a standard, including the reboring of cylinders, turning of crankshafts, fitting of bearings, etc., in such a way as will assure dependable service.

The Personnel

The personnel of the operating department includes the general roadmaster, the assistant general roadmaster and a motor car supervisor. Through the office of the general roadmaster, the field requirements are known for distribution, shopping, repair and other details of the equipment.

Motor equipment meetings are conducted periodically by the general superintendents and attended by the mechanical superintendent, the mechanical engineer, the machine shop foreman, the general storekeeper, representatives of the engineering department, the motor-car supervisor, the assistant general roadmaster, the general roadmaster and others interested. These result in a better understanding of the importance of machinery and equipment and their operation.

The motor-car supervisor has made a 4,500-mile motor car trip over the line in each of the last two years, imparting instructions, distributing literature and specifications to foremen and discussing with them the manner of handling all field repairs possible. Incidentally he dwells forcefully on safety in operation as a guard against accidents. This supervisor makes a thorough inspection of each car and enters his observations on a form report which is filed and used in handling the car throughout the year.

Prepare an Annual Shopping Schedule

A shopping schedule is made up annually, showing the month and date of the month that the roadmaster shall forward a car for repairs, and the superintendents see that cars on the schedule are forwarded so as to arrive at the shops on time. The schedule also provides for current shopping of weed mowers, discers, burners, track-laying machines, cranes, etc., as well as motor equipment in use by the telegraph and the bridge and building departments and for a certain number of emergency shipments.

The shopping schedule has resulted in a uniform run of cars for repairs the year around, in contrast to the trouble formerly experienced of having foremen hold their cars until winter, causing congestion at the shops and many months delay to cars awaiting overhauling. Likewise, the motor shop force would have to be reduced to a very low point in the summer through lack of cars to work on, while some outfits were at the same time in poor condition and thereby causing delay to the forces.

A stock of repair parts is carried for various types of machines and shipments from this are made promptly on the receipt of full descriptive requisitions after they have been checked by the supervisor of motor cars and recorded. Considerable repair work is done on the road by the foremen, who are taking such an interest in it that they are permitted even to replace engine bearings. Wherever it is necessary, however, to make a change in main bearings or in a crankshaft, a full assembly of the shaft and bearings is forwarded for exchange and the return parts reclaimed. When a shaft is under size, it is turned to equal dimensions at each end and this fact is recorded by stenciling the exposed end.

A check is made to insure that replaced parts are

returned and a survey is made of tool houses so that no unnecessary parts are stocked on the line. In the case of section cars, each foreman is required to show on his monthly material report the amount of gasoline consumed and the mileage made, which information is compiled at the close of the year for comparisons and in many instances leads to the correction of a mechanical defect. A loose-leaf record is kept for each car, showing the engine number, model, type, foreman in charge, number of shoppings and repairs furnished, also any outstanding features in the way of accidents or improper handling by the man in charge.

This system of caring for roadway machinery has been in full effect for about a year and a half and satisfaction is evident in many ways. Among the benefits is the large return secured by keeping cars in service and thereby dispensing with a great deal of unnecessary equipment, not to mention the many advantages of lesser importance that are becoming evident.

Maintenance and Mechanical Departments Co-operate

By K. H. HANGER
Engineer Maintenance of Way, Missouri-Kansas-Texas Lines, Dallas, Texas

WORK equipment on these lines is maintained in regular locomotive and car shops. This classification includes steam shovels, pile drivers, locomotive cranes, ditchers, spreaders, dump cars, ballast cars, camp cars, etc. Roadway machines generally, such as motor cars, automobiles, weed cutters, weed burners, track oilers, power ballast screens, mechanical tie tampers, paint-spray machines and the like are repaired in the motor-car shop at Dallas, Tex. In addition to the work done at the two classes of shops mentioned, some work on roadway machines is done at the system reclamation plant, depending on the size of the unit and the need for heavier shop facilities than obtain at the motor-car shop.

We have no especially equipped maintenance of way shops for work equipment on these lines. Our repair parts for work equipment are kept in stock by the forces under the chief mechanical officer, and for roadway machines in a special store under the supervision of the stores department at the motor-car shop at Dallas. They are dispatched from these locations on request of the maintenance officer operating the machine for which they are needed.

The organization of the operating department on these lines is on a divisional basis, and the work of the forces under the chief mechanical officer is closely co-ordinated with that of those under the engineer maintenance of way, so far as work equipment is concerned. We have a supervisor of work equipment, who reports jointly to the chief mechanical officer and the engineer maintenance of way. Formerly there were two work equipment supervisors on these lines, one looking out for the shopping and general repairs and reporting to the chief mechanical officer, and one following the operation of the machines and field repairs, reporting to the engineer maintenance of way. However, we found several years ago, that the duplication thus introduced was unwarranted and that one supervisor, reporting as outlined above, is entirely satisfactory and sufficient. Repairs to work-equipment units in the locomotive and car shops are made under his supervision and, to a considerable extent, by shop gangs who regularly repair or maintain this equipment.

On a system of this size, with the organization which now obtains, I can see no need for a small duplicate shop unit for repairing work equipment. It would mean additional investment in buildings, machinery and tools and a greater expense for the hire of supervisors and mechanics, with no compensating advantage. At this time our work equipment is in somewhat better condition than it has been previously. The overhauling of our machines is programmed to suit both the chief mechanical officer's general shop programs and the roadway program for rehabilitation and improvement work. The system works efficiently and satisfactorily and, in my opinion, less expensively than would a separate organization under maintenance of way officers.

Steam Shovels Just Released from the M.-K.-T. Locomotive Shop at Parsons, Kan.

Motor-Propelled Machines Are Different

In the matter of roadway machines, conditions are a little different, as most of these are either motor propelled or motor operated, and require men of somewhat different training than shop mechanics. Our motor-car repairs, with which is coupled the repair of most of our other roadway machines, are carried on by an organization of automobile or gas-engine mechanics under the general supervision of the engineer maintenance of way, and have proved satisfactory and efficient.

While this work might be administered just as

well as by the chief mechanical officer, our plan has proved a satisfactory one. In any event, a separate organization would be required to carry on the work of maintaining roadway machines and since that is necessary, I believe better results accrue from an organization and shop under the supervision of maintenance officers than would obtain ordinarily from a separate organization attached to the mechanical shops.

At this time, I know of no change I would suggest in the plan followed for a railroad the size of the Missouri-Kansas-Texas with the number of units of work equipment and roadway machines employed. The transportation, mechanical and maintenance forces converge in the authority of the vice-president and general manager, and the degree of coordination between them is most satisfactory and has been productive of neither friction nor delay.

Interior and Exterior Views of M.-K.-T. Motor-Car Shop

Best to Have Separate Shop Under Mechanical Department

By Earl Stimson

Chief Engineer Maintenance, Baltimore & Ohio, Baltimore, Md.

LABOR-SAVING equipment is machinery and its design, construction and upkeep is the work of the mechanical engineer and the machinist. The organization of the railroad includes a motive power and equipment department, otherwise called the mechanical department, which is equipped with the facilities to carry on the work of repairs to equipment of this kind. It is logical and in accord with the principles of good management that the department that is especially organized and equipped for it, should maintain all mechanical equipment regardless of the department using it. It therefore follows that the machines used in maintenance of way work—steam shovels, ditchers, pile drivers, locomotive cranes, spreader cars, concrete mixers, hoisting engines and others, should be maintained by the mechanical department.

The use of labor-saving equipment extends to all the operating departments. Locomotive cranes are in general use in the mechanical, stores and transportation departments as well as in the maintenance of way department. Motor trucks are in use in freight houses, storehouses and shops—and the automobile bus and truck, supplanting local train service, are now included in the special equipment on many railroads.

On a large railroad there are now so large an amount and such a variety of this equipment, that its maintenance seems to warrant special treatment. The division shop and the locomotive repair shop are provided for the purpose of repairing locomotives and turning them out on schedule. The handling of this special equipment through such shops interrupts the schedule, which makes it undesirable to send this work there, except for light and emergency repairs, and results in delay in the repair and return of the equipment to service.

On our road this equipment has been repaired in both mechanical department shops and in a maintenance of way shop. The heavy repairs to the equipment used by the maintenance of way department are made in the shop of that department and the running repairs made in the local mechanical shop. Equipment used by the mechanical and other departments is also repaired in the mechanical department shops.

Should Be Placed Under Mechanical Department

The work now has so outgrown the maintenance of way repair shop and has so impeded the regular work in the mechanical shops, that the solution seems to be a system shop under the mechanical department, devoted exclusively to the repairing and overhauling of special equipment of all kinds and for all departments.

My experience leads me to believe this is best. The mechanical department is certainly best fitted to handle this work, for it is mechanical work. It certainly can be done more economically in a well equipped and especially designed central shop by mechanics specializing in this class of work, than if done at many scattered points on the system. The maintenance of way engineer has his hands full enough if he keeps these well-maintained machines working full time on schedule. An idle machine brings in no return.

The Big Four Operates a Central Repair Shop

By Paul Hamilton

Assistant Chief Engineer, Cleveland, Cincinnati, Chicago & St. Louis, Cincinnati, Ohio

WITH THE gradual increase in the amount of equipment used in the maintenance of way department, the problem of its most efficient and economical maintenance presented itself. In the beginning, it was the practice for each division organization to repair and maintain its own equipment and tools except large machines such as steam shovels and locomotive cranes. However, it was found that this practice resulted in a very great variation in the methods as well as the costs of such maintenance. It was also found that a uniform standard in the

maintenance of such equipment was not being obtained under these conditions.

About ten years ago it was decided to concentrate this work at Indianapolis, Ind., which is a central point in the territory covered by the Big Four. All maintenance of way equipment is repaired at this shop except large machines requiring boiler work, such as steam shovels, cranes and ditchers. Tools for the maintenance of way department are also repaired there. The shop building is 231 ft. by 47 ft. and comprises a blacksmith shop with a power hammer, a machine shop equipped with the usual tools operated by electric motors, and a carpenter shop with wood-working machinery suitable for making frames, when required, for the various machines repaired there. In connection with this shop, and adjacent to it, the store department maintains a store-room in which is kept a full stock of repair parts and supplies for the equipment in use by the maintenance of way department.

Motor Cars the Principal Problem

The greatest amount of work performed at this shop is in connection with the maintenance of motor cars. All motor cars requiring repairs, except such as can be made easily and economically by the operator of the car, are sent to this shop. Where the operator can make the repairs, he makes a requisition for the parts needed and, after this requisition has received the required approval, the parts are furnished to him direct from the store-room maintained in connection with this shop. When the car to be repaired is received at the shop, it is dismantled and carefully examined to determine the repairs necessary and the cost of the repairs. Wherever the estimated cost of repairs exceeds certain figures that have been fixed for various types of cars, the shop supervisor reports the facts and asks for further instructions on the car. It is then decided by designated authority whether the car will be repaired or scrapped. If the car is repaired it is returned to the location from which it was sent in. The cost of repairs to the car is entered on the records kept for each car. Full information is thus available as to the cost of operation and maintenance of the cars. In the case where the car is scrapped, authority is obtained to cover the purchase of a car to replace it.

Handles a Variety of Equipment

The repairs for mechanical tie tampers are handled in the same way. Rail loaders, concrete mixers, hand and push cars, and rail-laying equipment, are likewise repaired at this shop and the same methods are used in each case to determine the economy of repairs as has been described in the case of motor cars. Maintenance of way tools from all divisions of the line are likewise sent to this shop for repairs, although some tools are repaired at outlying points during the working season. Certain tests or requirements are used at the shop to determine whether it is economical to repair or scrap them.

It has been found that by concentrating repairs of machines, cars and tools at a central shop, the work is done more economically and it is possible to secure a uniformity in the standards of maintenance of both tools and equipment, which was not possible when this work was done at widely separated points without the close supervision it now receives. In the case of the Big Four, the location of the central repair shop at Indianapolis is such as to serve the entire system with a minimum delay.

Two Roads Report Awards

SUPPLEMENTING the reports of prize awards to foremen, roadmasters and supervisors in connection with annual track inspections of various railroads, published in previous issues, we present below brief statements of the awards made on the Baltimore & Ohio and the Southern Pacific, Texas and Louisiana lines:

B. & O. Awards 71 Cash Prizes

In making the annual track inspection on the Baltimore & Ohio, each engineer maintenance of way's territory is considered as a unit, within which each division is considered separately and, in general, is awarded four prizes: One prize of $100 for the best supervisor's district; one prize of $50 for the best main-line section; a prize of $35 for the best branch-line section; and a prize of $35 for the main-line section having shown the most improvement during the year.

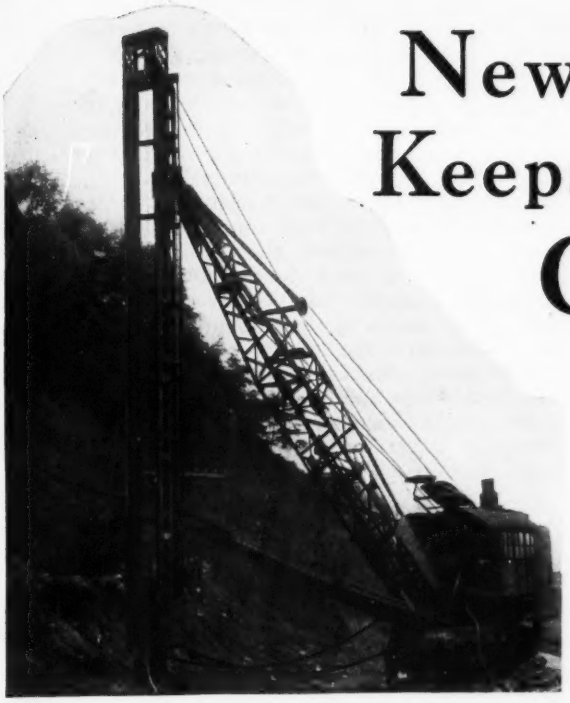
In determining the winners of the supervisors' and foremen's prizes, the various engineers maintenance of way, with their division engineers and assistant division engineers, go over their respective territories and act as a committee of judges, rating each section and supervisor's district on such features as surface, line, ditching, general appearance of roadbed, policing, etc. As a result of the inspection for 1928 a total of 71 prize awards was made. Of these, 18 were prizes of $100 awarded to supervisors of districts receiving the highest rating on each division; 19 were prizes of $50 to foremen of the best main-line sections on the various divisions; 19 were prizes of $35 awarded to main-line foremen whose sections showed the greatest improvement during the year, and 15 were prizes of $35 each, awarded to foremen of the best branch-line sections. Following is a list of supervisors who were awarded prizes of $100: F. Ernst, Philadelphia, Pa.; C. W. Selby, Point of Rocks, Md.; C. Foltz, Hancock, W. Va.; T. A. Laffey, Piedmont, W. Va.; H. H. Tederick, Fairmont, W. Va.; A. L. Lowe, Huntington, W. Va.; J. E. Conley, Gassaway, W. Va.; B. F. Hanna, Rockwood, Pa.; R. L. Schramm, West Newton, Pa.; Geo. Mitchell, Wellston, Ohio; B. C. Runyan, North Vernon, Ind.; B. O'Brien, Carlyle, Ill.; F. A. Jones, Rossford, Ohio; W. M. Wells, Indianapolis, Ind.; C. A. Nunes, Newark, Ohio; J. Clark, Walkerton, Ind.; B. K. Shatto, Lodi, Ohio; and J. I. Malone, Cleveland, Ohio.

Results on the Southern Pacific Lines

A total of $6,675 was paid out in prize money by the Southern Pacific Lines in Texas and Louisiana to foremen whose sections received ranking scores in the annual track inspection conducted during November and December. First, second and third prizes of $100, $75 and $50, respectively, were awarded in each roadmaster's district on the basis of scores made. In addition, the ratings accorded to all the foremen in each district were averaged for the purpose of comparing the average ratings by districts. On this basis the Glidden district on the Houston division, of which George Reiss is roadmaster, received the high score of 96.4. Two sections tied for first place for the entire system with a score of 97.3. These were Section 60½ on the Glidden district, Foreman H. Roper, and Section 5, Navasota district, Dallas division, Foreman R. McRee.

New York Central Keeps the Machines On the Job

Each division is held responsible for the maintenance and operation of its own equipment



Pile Driver Leads Have Added Another Important Use to the Locomotive Crane.

ONLY a few years ago the bridge and building forces of the railways were practically man-power organizations, handling most of their work with manually-operated tools and brawn. About the only types of equipment in common use were pile drivers and stiff-leg derricks, and in some instances steam-driven air compressors. Today, the situation has changed, and while man power and manual skill are still essential in bridge and building work, many of the laborious tasks of the past are now being performed with less physical effort, with equal or greater skill, and with greater speed and economy through the use of labor and time-saving equipment.

Practices surrounding the operation of labor-saving equipment on different roads, while designed to the same end, vary considerably. Certain roads have built up specific organizations which are definitely responsible for the assignment, operation and maintenance of all labor-saving machines and devices on their roads. Other roads have found that most satisfactory results can be secured by placing the responsibility for each unit of equipment definitely upon the local organization to which it is assigned, with the authority and direction for its assignment and use centered in the division officers. Such is the practice observed on the New York Central, Buffalo and East, where, under ordinary circumstances, each division is given full jurisdiction over the equipment assigned to it, and at the same time is held strictly accountable for its careful maintenance and efficient performance.

Bridge and Building Forces Well Equipped

Few roads have equipped their bridge and building forces more completely than the New York Central, and while there is nothing radically new or novel about the practices of this road in regard to the operation and care of its equipment, it can be said with equal truth that there are few roads which have been able to operate and maintain their equipment in a more effective and satisfactory manner. On this road, locomotive cranes equipped with buckets, magnets, pile-driver leads and steam hammers have replaced the old stiff-leg derricks; self-propelled pile driver units have replaced the lighter and slower pile driving equipment of earlier days; highly efficient gasoline and oil engine air compressors have come into extensive use; pneumatic bridge tools have largely replaced hand tools; the acetylene torch is being used almost exclusively for steel cutting work; paint-spray equipment has largely superseded the brush in bridge and building painting work; power-operated saws and wood working machinery have replaced the hand saw; tie dapping machines have lightened the work of the adze; heavy-duty track motor cars have replaced the hand car; and highway motor trucks are expediting the handling and delivery of tools and materials and are eliminating the expense of many work trains.

On the Eastern lines of the New York Central, where the trackage of the various divisions averages about 800 miles, each division is a unit by itself, except that in emergency the equipment of any division is placed at the service of any other division that may require it. In this way, responsibility for the equipment is divided among the various divisions.

The advisability of work equipment in the bridge and building department is no longer a question on the New York Central, and at the present time it is not so much a question of whether labor-saving equipment should be introduced in connection with a specific class of work, but "what is the best adapted and most effective equipment available for doing the work in question." The character and extent of the equipment furnished these forces on the various divisions is seen, for example, in the following partial list of equipment in use on the Mohawk division:

1 Track pile driver, equipped with a steam hammer
2 Locomotive cranes, equipped with pile driver leads, steam hammers, buckets and magnets
2 Steam-operated hoisting engines
3 Paint spraying outfits
6 Concrete mixers
2 Portable air compressors
Pneumatic bridge cleaning tools, such as rotary wire brushes, chipping hammers, etc.
1 Sand blast outfit
Pneumatic riveters and rivet cutters

4 Portable, gasoline motor-operated, double-acting diaphragm pumps
1 Power-operated wood working machine
1 Tie dapping machine
3 Acetylene torch outfits
Heavy-duty motor cars, trailers, etc.

In general, this equipment is typical of that furnished to each of the other ten divisions of the lines, Buffalo and East, although any one division may have a larger or smaller number of units of any particular type of equipment, depending upon its specific requirements.

The responsibility for purchasing the large amount of equipment on the New York Central, in the last analysis, rests with the engineer maintenance of way, the chief engineer maintenance of way and the management, but to a large extent the purchases are made as a direct result of recommendations by the men on the divisions, who have to use the equipment, and who know the specific requirements which must be met. In all cases, requests for new or additional equipment must be accompanied by statements of facts which will justify the purchase, and in special cases, exhaustive service tests are required to prove the economies which the new equipment will bring about. As a result, the men in the bridge and building department are furnished with equipment which they approve, and which can be depended upon to meet their requirements and to function effectively and economically.

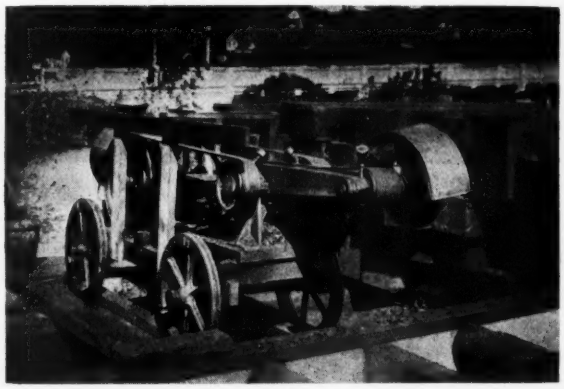
Operators Are Selected Carefully

When equipment is assigned to a division on the New York Central, the sole responsibility for its intensive use and careful operation and maintenance goes with it. Directly, the division engineer is held responsible to the engineer maintenance of way, and he in turn places the major part of his responsibility upon his supervisor of bridges and buildings. There is no pooling of labor-saving equipment on the New York Central, either on a division or between divisions, except in emergency. When a unit of equipment, such as a crane, compressor or paint-spray outfit, is assigned to a gang, it practically becomes the property of that gang. This practice has resulted in the various gangs taking unusual pride in the condition of their equipment, and has brought about a much higher standard of maintenance than could be expected under other circumstances. This practice of tying the equipment to specific divisions and gangs has also stimulated greater interest on the part of division officers in the output of the equipment than could be expected if the equipment were subject to frequent transfer from one division to another.

In order to secure the most from its labor-saving equipment, careful attention is given on the different divisions to the selection and training of the operators of the various units. This is done because it is a well-known fact that, depending upon the interest and ability of the operators, equipment will be operated and maintained in either an efficient and intelligent manner, or in an inefficient and careless manner. In practically all cases, the New York Central has been able to find men in its forces who make good operators. These men are selected with care, and are given special training in the handling and repair of the equipment to which they are assigned. It is also the practice to train assistant or relief operators so that in emergency or in the absence of the regular operator, the equipment will still be in competent hands.

The assignment of bridge and building equipment on a division is left entirely to the discretion of the bridge and building supervisor, subject only to specific orders from his division engineer. In this way, each supervisor knows at all times just what equipment is available for his forces, and can arrange his work, without interference, in the manner which will be most conducive to getting the work done and to keeping his equipment in operation the maximum amount of time. As each supervisor is in more or less constant touch with his various gangs and the progress of their work, he is, therefore, in a good position to compare the effectiveness with which these gangs are using the equipment which has been assigned to them.

In general, it has been found difficult to reduce the output of bridge and building department equipment to a basis of output per unit of man-hours, but where this is practical, a record is kept of the output of the various machines to insure that they are performing properly. Ordinarily, a check on the performance of the larger units of equipment in the bridge and building department is secured through the daily and weekly progress and work reports made by the gang foremen and equipment operators to the bridge and building supervisors.



The Tie Dapping Machine Which Saves Much Labor on the Part of the Bridge Forces

Proper Maintenance and Repair Are Essential

The general maintenance and running repair of all of the equipment used in the bridge and building department of the New York Central are taken care of by the equipment operators, who are assisted, when necessary, by mechanics employed in the bridge and building department. For all heavy repairs, and for general overhauling, each division maintains its own bridge and building repair shop to which the equipment is sent. Most of this class of work is done during the winter months or at seasons when the equipment is least in demand.

On the Mohawk division, the shop of the bridge and building department is located at Utica, New York, at about the mid-point. This shop, which is fitted with such special equipment as electric-operated wood and metal drills, a metal lathe, and a power-operated pipe threading and cutting machine, handles all overhauling and major repairs of the equipment of the bridge and building department, except such work in connection with the pile driver and cranes. This shop also provides space for the under-cover storage, during the winter, of all such equipment as compressors, pumps, concrete mixers,

motor cars, etc., which may not be in use during that season. The heavy repair work on the pile driver and cranes on the division is handled at any one of four mechanical shops to which the equipment may be assigned.

All of the labor-saving equipment of the maintenance of way department on the New York Central, Buffalo and East, including that in the bridge and building department, is operated and maintained under the general supervision of one maintenance of way department mechanical inspector, who, while having no direct jurisdiction over the assignment and use of the various units, keeps in close touch with their condition and makes recommendations concerning what may be necessary at any time to keep them, or to put them in the best possible shape. This inspector, who spends most of his time on the road, has headquarters in the office of the engineer maintenance of way and reports direct to the engineer maintenance of way.

Through these arrangements for taking care of labor-saving equipment on the various divisions, the equipment of the bridge and building department as a whole is not only maintained to a high standard, but there are few delays to bridge and building work because of the breaking down of equipment or the failure of parts in the field. Further, if a breakdown or failure should occur, there is little red tape in connection with securing needed parts, or delay in securing the necessary assistance to make repairs. If repair is urgent, the operator or gang foreman gets in touch promptly with his supervisor or with the bridge and building department mechanic on his division, by phone, and explains the nature of the breakdown and the parts which may be required. At this time, he may also request the assistance of the mechanic if the repair work is such that he can not handle it himself.

Spare Parts Can Be Supplied Promptly

In most cases, the operators of work equipment are supplied with standard lists of parts for the specific equipment to which they are assigned, and in this way, they are able to designate accurately the exact parts which they may require. The division bridge and building department mechanic, however, has detailed drawings and lists of parts, covering all of the equipment on his division, so that in any case there is no difficulty in designating the parts required.

Under ordinary circumstances, when there is no particular hurry for the needed repair parts, the requisition covering their purchase or release from the storehouse is handled in the usual routine manner, being prepared by the bridge and building supervisor, approved by the division engineer in writing, and then forwarded by railroad mail to the division storehouse. In emergency, however, when a disabled unit of equipment would mean costly delay in carrying out a piece of work, or the tying up of a considerable labor force, the routine formal method of making requisitions is dispensed with, even to the extent that a supervisor can make a verbal request on the storehouse for parts needed, if his division engineer cannot be located. In such cases, which are unusual, the supervisor uses his best judgment in the matter, and subsequently arranges for the issuance and approval of a formal requisition to cover the parts furnished. In this way, emergency needs are met in a minimum of time, with the least delay to the disabled equipment and to those operating forces which may have to remain idle until repairs can be made.

With the main responsibility for the care and upkeep of all bridge and building equipment resting directly on the operators of this equipment, closely supervised by the division mechanics and the maintenance of way mechanical inspector, most satisfactory results have been accomplished in keeping the equipment clean and in good working condition. This has resulted in part, no doubt, through the pride which many of the operators have taken in equipment placed solely in their charge, and furthermore, because each operator has been made fully aware that it is as much his job to keep his unit of equipment clean and in good working order as it is for him to operate it.

This care of work equipment is taken not only while the equipment is in actual use, but also during periods when it is out of service. Thus, during the winter, for example, all of the smaller units of equipment are given a thorough cleaning, and overhauling if necessary, and are then stored under cover. Likewise, the larger units of equipment are given special attention when out of service, and while it has not always been found practical to keep them under cover, care is taken to see that they are well greased and protected against tampering and abuse when they are to be idle.

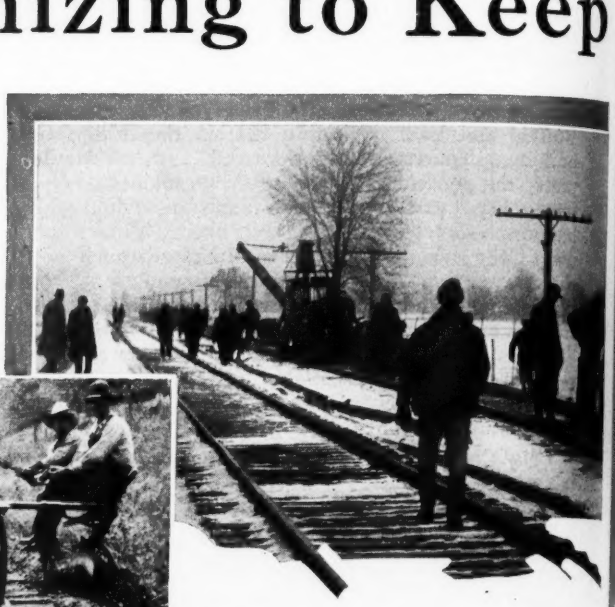
Equipment Is Used Intensively

While there are a number of conditions, such as the condition of the weather, which make it impractical, and in some cases impossible, for the New York Central to keep all of its equipment in service the year around, the goal sought is to keep the equipment in productive operation as many days of the year as possible, particularly during the working seasons, so as to secure the greatest return on the investment in the equipment. This fact, which has become more and more important with the increasingly large investment that is being made in labor-saving equipment, is fully appreciated by the division officers who are responsible for getting the maximum return from the equipment assigned to them. In the first place, much care is exercised by division engineers and bridge and building department supervisors in programing their work so that their equipment will be kept busy the maximum time, and so that it can be moved from job to job with a minimum of delay. Thus, for example, bridges and buildings are generally repaired in station order to avoid the loss of time in moving the equipment back and forth over long distances, and the painting program of each division is arranged so that most interior work will be done during the winter, thus keeping the paint-spraying equipment in service throughout the year.

Rigid care and a high standard of upkeep of the equipment, as already mentioned, are insisted upon so that there will be a minimum of interruptions to the equipment during the working season. Whenever there is a lull in any program, the equipment which would become idle is at the service of the bridge and building forces of any other division which may be able to use it effectively. Likewise, idle equipment is at the service of the other departments of the road. In fact, the joint use of certain units of equipment by two or more departments is not at all uncommon on the New York Central, and it has been through this arrangement that the purchase of certain items of equipment has been justified, when the same could not be said if the equipment were used exclusively by any one department.

Organizing to Keep

Every day that the equipment is idle it loses money



ASSUMING that equipment is properly maintained, the next and even more difficult problem is to keep it at work. Every day that a machine is idle it loses money; yet every road is confronted with idle machines because of the inertia of the men in adapting their methods to the machines, because of lack of a definite program that will permit the machines to be transferred from section to section and from division to division without delay; and because of a lack of supervision, general or local, which will bring these conditions to light.

The magnitude of this problem is becoming more generally appreciated as the amount of money invested in equipment increases and various roads organize to meet this condition. In the articles which follow, five men who have given this subject special attention, describe the methods which they have devised on their individual roads. The prompt transfer of equipment from one point to another and the scheduling of work to utilize this equipment continuously have been found effective by W. P. Wiltsee, chief engineer of the Norfolk & Western. The compilation of performance records from daily reports have demonstrated their value on the Louisville & Nashville, both by bringing to light delays in the use of equipment and by stimulating rivalry between forces. This method is described by J. R. Watt, general roadmaster of that road.

The importance of reorganizing methods of work to adapt them to the equipment at hand is emphasized by Emmett Keough, formerly assistant engineer maintenance of way of the Canadian Pacific, eastern lines. On the Illinois Central the more intensive use of equipment has followed the scheduling of work and particularly the development of an organization for the supervision of this equipment to insure that it is not allowed to remain idle. The method by which this is effected is described by L. H. Bond, engineer maintenance of way. The importance of the human element and the necessity for stimulating the interest of employees who are to operate equipment is emphasized by G. A. Phillips, engineer maintenance of way, Lehigh Valley, who describes the methods adopted on that road to increase output. These various articles appear below.

Must Be Shifted as Needed

By W. P. Wiltsee

Chief Engineer, Norfolk & Western, Roanoke, Va.

THE principal labor-saving equipment now in use in the maintenance of way department on this railroad consists of Jordan spreaders, with suitable ditching attachments, ballast-cleaning machines, rail-laying machines, locomotive cranes, ditchers, etc. All of this machinery, with the possible exception of the rail-laying machines and the ballast-cleaning machines, is so distributed and shifted from one division to another as to enable us to keep it busy practically the year round, and wherever a shortage of machinery exists, the particular work needing such a machine on one division is deferred until the completion of similar work on another division, at which time the machine is transferred promptly.

In the case of rail-laying machines, which are used in our rail renewals between October 1 and April 1, we are not always able to keep all of these machines busy during the summer months, but such of them as can be used are employed in the handling of miscellaneous materials around our principal yards and occasionally we use them in connection with bridge work, handling of bridge timbers and other materials.

Our men in charge of these machines are always ready to co-operate with their superior officers in carrying on the work and are always willing to use the machine or the methods from which the best results can be obtained. The foreman in charge of such machines is required to make out a daily report showing the location, work performed, etc., which enables the superintendent to transfer the machines

Machines Busy

promptly upon completion of the work to some other place of use.

We carry in stock a nominal supply of repair parts for the different machines, and our supervisor of bridges and buildings is responsible for the repairs to most of the maintenance of way machines, but major repairs are made in our shop. When a machine is out of commission undergoing repairs, the foreman keeps in close touch with the work, so that there is no unnecessary delay.

Keep the Machine Busy

By Emmett Keough*
Western Representative, American Fork & Hoe Co., Chicago

THE progress of a rail-relaying gang has been governed so long by the slow, laborious movement of the tong men that most maintenance men now feel that with the adoption of power machines, their troubles are over. These machines do not tire and are capable of setting in rail at a rapid rate and they should be allowed to do so. It may now be noted frequently that other operations in this work are the cause of delay to relaying jobs and that the gang with the rail-handling machine is actually loafing on the job.

Should not these machines be considered the "controlling unit" of the organization, and the other units of the gang built up to function in unison with it? It really seems unfair to the operating department to hold a track open six to eight hours daily without setting in every possible rail that the machine is capable of placing. This cannot be accomplished by the practices usually followed but can be effected rather by a considerable amount of preliminary work, such as cleaning out and applying new tie plates through road crossings, placing new plates on bridges, thinning out spikes and scoring ties for adzers. The bolting and assembling of new joints is also a big handicap to the speed of a relay gang. Rails may be grouped into two or even three-rail units, with all bolts completely tightened, insulated joints applied and even bonding done in advance of the rail gang.

It will be found that nearly half of the work necessary for changing rail may be done under traffic, either in advance of or behind the new rail, all of which tends to cut down the size of the gang needed actually to set in the rail and make it safe for traffic. During an active advertising campaign for a popular automobile some years ago, one member of a group of automobile salesmen stated that "we are now turning out a complete car every *two* minutes." Another member of the party then replied that "although this speed looked pretty good when compared to a few years back, we still have something to "shoot at" since it was well known that "There's a fool born *every* minute."

If two or even more rails can be set in place each minute by a machine, no one connected with such work should be content until this is done. It then may be found necessary to start another good machine at work on the opposite rail and thus leave still further room for improvement elsewhere in the organization. These results cannot possibly be secured without considerable work being done under traffic, even though only necessary work is done during the time the track is open.

*Mr. Keough was formerly assistant engineer maintenance of way, Canadian Pacific, Eastern lines.

Publish the Best Records

By J. R. Watt
General Roadmaster, Louisville & Nashville, Louisville, Ky.

THE BEST way to keep labor-saving equipment in service is to buy dependable equipment and keep it in operating condition. It is necessary to organize for any program involving its use, and, if the equipment fails the entire program has to be changed. I think failure to keep such equipment in operating condition is responsible for much lack of interest in running it.

These and other conditions entering into the service to be obtained from labor-saving equipment must be made the subject of constant supervision. It is a help to compile data on the performance and the time operated, and advise all concerned as to the performance of all machines.

For each machine, such as compressor, motor car or crane, a report should be made of the fuel consumption, hours operated and work done, so that an analysis can be made, not only to show whether the fuel is being used economically, but that the machine itself is being used.

For instance, out of 28 air compressors in track work and rock work, four have been selected as having given outstanding service and their record, which is as follows, is being called to the especial attention of all concerned:

Compressors, all four-tool	Hours operated	Gal. of gas. used	Track tamped, miles	Gal. per hour
5 by 5	1900	2365	24.1	1.2
5½ by 5	1698	2608	24.8	1.5
5½ by 5	1385	2066	28.9	1.5
7 by 6	1662	5022	34.6	3.0

It is very desirable in promoting the use of labor-saving equipment to make it as convenient as possible to handle. Air compressors must not only operate satisfactorily, but they must be placed on or off the track quickly and with the least possible effort so as to keep down complaints about delays and, in general, to make the equipment more attractive to operate.

Scheduling Creates Interest

By L. H. Bond
Engineer Maintenance of Way, Illinois Central, Chicago

THE problem of finding work with which to keep machines busy has not troubled us. We do find some trouble in keeping the labor-saving devices located at points where they can accomplish the most and bring the biggest returns.

A labor-saving device may be used to perform service and bring about improvements which tend to elevate the standards of maintenance. Our problem, however, is to use to the best advantage labor-saving devices we now own so that we may accomplish all of the tasks there are to do and to do these tasks as economically as possible.

For a number of years we have maintained on the division, and in consolidated form in the general office, records indicating the performance of the various labor-saving devices, these records showing the amount of work performed and the cost of doing work with the labor-saving device, as compared with the cost of doing similar amounts of work by the old method. Information is furnished by individual machine numbers covering the number of days worked during the periods for which the reports are made. If the number of days worked does not compare favorably with the average, an investigation is made.

To stimulate interest in the use of labor-saving devices, statements are circulated periodically showing the cost per day to own the machines and the number of days the machines will have to be worked before any profit accrues.

Labor-saving devices are assigned to sections, districts, divisions or grand divisions and in some few cases are used as system machines. Some machines, such as mowers and discers, work continuously over a prescribed territory during the weed-growing months. The length of territory is such as to permit the machines to get over the territory often enough to prevent a ragged appearance of the roadway. Some machines, for example, ditchers and track oilers, are worked on a schedule made up at the beginning of each year by the ranking maintenance of way officers on the territory to which the machines are assigned. When an officer knows an acknowledged labor-saving device of merit will leave his territory on a certain date, he will be very active in having it do all the work possible before he loses it.

The discussion of published reports or articles showing the greater output, as well as the decreased cost of work done with labor-saving equipment, cannot but appeal to the old timer, no matter how set in his ways. Contact with his associates and officers keeps him apprised of the increased efficiency obtained with the various labor-saving devices, but I believe the most compelling force for the increased use of labor-saving devices is that resulting from curtailed allowances. The labor-saving devices must be used, or the section, district, division or whatever territory is served, cannot be maintained to the point where a safe and comfortable riding roadbed is obtained.

The organization must be such as to insure that the officer to whom a machine is assigned knows when the machine becomes idle. The report showing the condition of the machines and the number of days worked during a given period is before the supervisory officers. When an employer of a labor-saving device cannot use it to advantage his immediate superior is notified so that arrangements can be made to keep it at work. Information with reference to idle machines is available to district, division, grand division, and to system officers and the question of reassignment of idle machines sometimes is carried to the general officers in charge of maintenance. A call for a comparative statement of days used during a given period with a similar previous period stimulates interest and activity.

The problem of keeping labor-saving devices in repair and ready for continuous use belongs to the district or division maintainers. Ordinarily repair parts are kept in stock. This is especially so where a standard type of equipment is used, but if, for any reason, a maintainer has trouble in securing repair parts, he communicates with someone in the general office who can usually furnish prompt assistance in getting material out to the idle machine. This, of course, presupposes a reasonable stock of standard repair parts.

Human Element Most Important

By G. A. Phillips
Engineer Maintenance of Way, Lehigh Valley, Bethlehem, Pa.

AS non-productive capital expenditures for such purposes as train control and abolition of grade crossings are undertaken by the railroads, it becomes imperative for all concerned to put their shoulders to the wheel and to reduce operating expenses to the lowest possible limit consistent with safety and the service required. Necessity is the mother of invention and plays an important role in this operating drama. She has been responsible for the development of many mechanical devices and new ideas for improved and economical maintenance. However, this economy depends primarily upon—(1) the manner in which the machinery is utilized; (2) the hours of service; and (3) proper maintenance and operation.

The object of mechanical tools is to reduce man-hours of service and secure more nearly permanent uniform results. Therefore, it is perfectly obvious that great care must be exercised in properly organizing the work. Too many men defeat the purpose and an insufficient number doom it to failure. The supervisory officer is the key to the situation and, convinced himself, he must sell the idea to his foremen and men. It is, therefore, very important to pick the right men for supervisory positions. They must be leaders; they must do something the other fellow has not done. It is not always possible for these men to educate their forces to any great extent, but it is of primary importance to teach them how to *think*, and if this can be accomplished it will go a long way toward securing proper and advantageous use of new equipment. Many good ideas have been lost because they looked ridiculous and the men who offered them were not strong or forceful enough to see them through to ultimate development.

To use new equipment advantageously, you must have the support of your men. You must make them realize its importance and convince them it is practical. I have seen "so-called modern methods" forced on the men by their superior officers whose claims for the success of their efforts were similar to the saying that has been ascribed to surgeons, "The operation was a success, but the patient died." You cannot "put over" unsound practices on a gang of men successfully. You are only fooling yourself and increasing expenses. The prejudice of employees against machinery and their unwillingness to modify their methods to meet the needs of new devices can be overcome by thoroughly demonstrating their use and convincing them that the idea is sound.

The purchase of new equipment represents an investment and is, of course, a capital expenditure. Before this machinery can start to earn money or reduce expenses, it must "wipe out" the interest charge on the investment and this handicap must be kept in mind constantly, for interest "works while you sleep." With this in mind, a careful selection of equipment is necessary in order to adapt it to the various seasons of the year and provide it continual employment, if possible. To this end, constant effort must be made to utilize the machinery on as many different kinds of work as possible. For example, locomotive cranes have many uses that assure their constant service the entire year, and the ingenuity of our men frequently furnishes new ideas for additional benefits to be derived for our labor-saving equipment. In fact, this feature must be encouraged if progressive results are to be obtained and our machinery is to "earn a living."

No Substitute for Personal Supervision

The use of our equipment is checked up in a manner similar to that employed on most railroads, the reports showing, in general, the amount of work performed, the labor expended and the cost of operation and maintenance of the machine, together with the location and other data of a minor nature, varying with the class of machine involved. The reports are important in so far as office records are concerned, but, with proper supervision and organization, these reports, in my opinion, are only of small value. The really necessary information can and must be secured first hand by the supervisor himself. The progress of the work being performed by the particular machine is his barometer and it is his duty to know whether or not it is working efficiently every day. I know that a supervisor on the Lehigh Valley observes and investigates the work of every gang under his direction on five out of every six days and it is to this personal contact that we attribute our success in effecting a steady decline in man-hours and expenses from year to year without deferred maintenance.

The operation of this machinery continuously gets to be a habit and can just as well be acquired as to have the machinery idle a large part of the time. A striking example of hours of service of mechanical devices is shown in the operation of the pneumatic air tampers. These machines start about April 1, depending on weather conditions, and operate continuously until October 1 with practically no interruption, and the slogan over the entire road is to keep these machines operating every day, for an idle day can never be recovered and the work that could have been performed is gone forever.

It has been an essential feature of our system to have our men make definite plans for the maintenance work in their territories for a year in advance rather than to work from hand to mouth with nothing definite in mind. At the present writing, each supervisory officer in the maintenance of way department on this railroad has worked out a schedule which, if carried out, will properly maintain the property. It is impossible for machinery to remain idle waiting for transfer from one point to another. The supervisor is anxiously waiting to move it, but if he overlooks it, his foreman will call it to his attention.

Adequate Maintenance Essential

Even under the most careful management and organization, machinery will not operate efficiently unless properly maintained. Maintenance of way machinery of this class is largely composed of locomotive cranes, electric and pneumatic tie tampers, compressors, gas engines, motor cars and other tools of this nature.

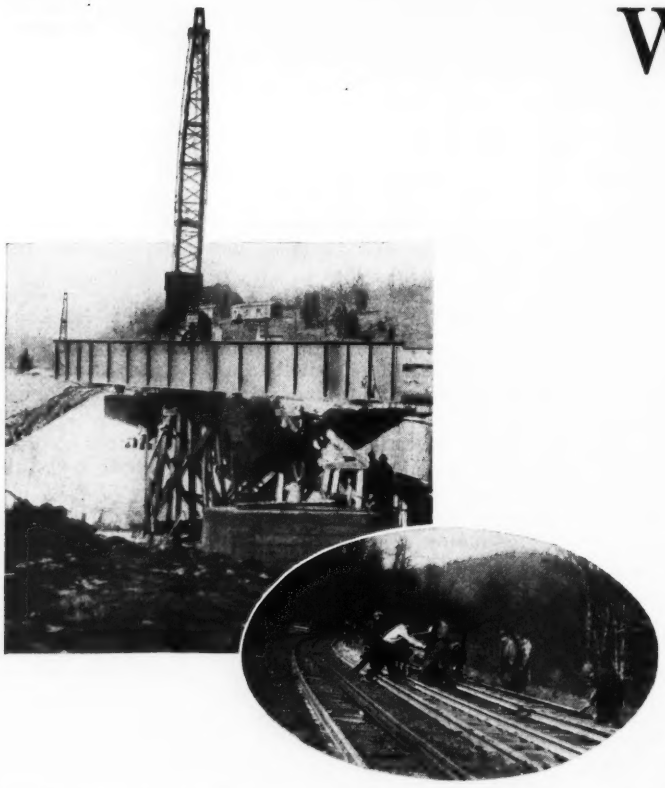
Locomotive cranes on this railroad are repaired by the maintenance of way department in a shop equipped exclusively for this purpose, although repairs and general overhauling are frequently made at division shops as occasion or economy requires. The crane operator is held responsible for the condition of his machine and prepares a monthly report of its condition which facilitates the ordering of necessary repair parts so that they will be on hand when the crane is ready to go to the shop. Minor repairs are made by the crane operators and light running repairs at division engine terminals as may be required. When a crane is forwarded to the shop, a complete report accompanies it and, if necessary, the crane operator confers frequently with the shop foreman in charge of repairs.

Motor cars, air compressors, gas engines and tamping tools are repaired at one central point, with a skeleton force on each division to make light running repairs and to give daily attention as necessary. Each division has a small stock of those parts that wear out most readily so that they can be replaced with little loss of time. We feel that more uniform results and a considerable reduction in force are obtained by centralizing our repairs at one point. Cylinders and pistons of gas engines and air tools wear rapidly and must be repaired to restore the original power of the machine. We found that air tamping tools with worn barrels and pistons produced too light a blow in spite of a 50 per cent excess consumption of air. These guns are tested each year for the power of the blow and for air consumption. Adequate maintenance of these tools results in less man-hours of labor, a decreased load on the compressor with a consequent reduction in repairs by reducing the load, and a more thorough tamping of the track.

In my opinion, the fundamental basis of success along these lines is not in attractive, voluminous reports indicating office efficiency, but in primary attention to the human side—how it is presented to the men in the field. We want more men who can do things and fewer to tell us how.

Careful attention to the human side of this problem, mixed with a little psychology and common sense, will go a long way to overcome the difficulties. It is possible to be wrapped up in the development of modern machinery and methods to the extent of overlooking the fellow who is going to operate it, although it is upon him that success depends.

Why It Takes a Deliver



The best results are obtained only when the equipment is placed in charge of properly trained employees

TO GET the maximum return from an investment in labor-saving equipment it is not only necessary that the equipment be properly maintained and that the work and equipment be so distributed as to keep it employed but it is also necessary that it be put in charge of properly trained operators. This raises the question at once as to whether a road should rely upon its ability to find "handy men" within its gangs to whom these machines can be turned over or whether it should set out to select men especially qualified for this work and then give them special training and if so by whom and for how long. Before considering this subject it is, of course, necessary to determine the extent to which the output of the machine is affected by the skill of the operator.

In the articles which follow, the various phases of this fundamentally important problem are discussed. Labor-saving equipment will be used efficiently only when its operation is supervised by an officer on whom full responsibility is placed for results, according to Bernard Blum, chief engineer of the Northern Pacific. A good machine and a good operator are a combination that produces results, in the opinion of W. H. Kirkbride, engineer maintenance of way and structures, Southern Pacific, Pacific system. The selection of operators from within the department in which the equipment is to be employed is desirable, according to C. E. Miller, supervisor of scales and work equipment, Chicago & North Western, because of the greater familiarity of these men with the work to be done. Supervisory maintenance officers are asked to be on the lookout for capable operators by C. H. Ordas, supervisor of motor cars, Chicago, Milwaukee, St. Paul & Pacific. After a man of the proper qualifications has been selected, G. M. O'Rourke, roadmaster, St. Louis division, Illinois Central, emphasizes the importance of giving him systematic training to insure that he becomes thoroughly familiar with the characteristics of the machine that he is to operate and with the work that it is to do. As a part of this training and for the purpose of providing versatile operators, J. B. Mabile, supervisor of work equipment, Chicago, Rock Island & Pacific, advocates that after he has mastered the operation of one machine, an operator be moved to other equipment in order that he may become familiar with all and thereby available for service whenever required.

Provide a Supervisor of Work Equipment

By Bernard Blum

Chief Engineer, Northern Pacific, St. Paul, Minn.

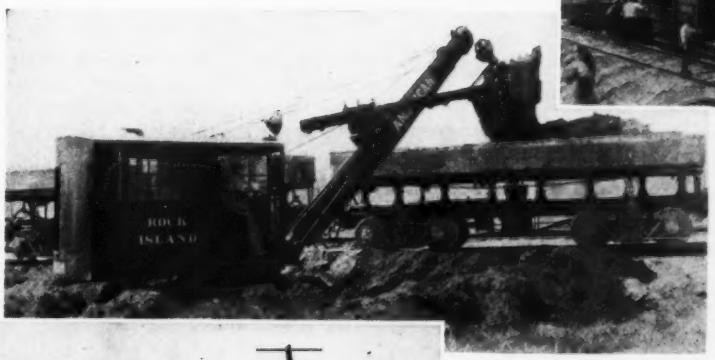
THE USE of maintenance of way machinery and labor-saving tools on American railways has lagged behind the application of similar machinery in American industry. Mass production, as exemplified by automobile manufacture, has been made possible only through the development of special machinery which has resulted in low operating costs with a corresponding low-priced product.

While it is true that one of our largest industries, the railroad, has been slow to avail itself of labor-saving devices for track, a number of such devices have been brought into use and are being extended rapidly. It must be realized that to be truly economical, the continuous use of machines, so far as practical, is necessary, as elements of expense such as interest and depreciation accrue against a machine whether working or standing idle, and unless proper recognition is made of this, its purchase may result in no lower but possibly in increased costs.

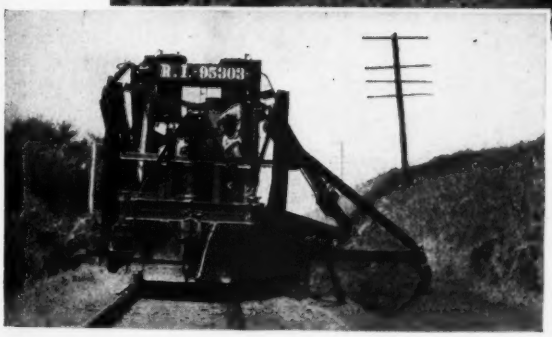
The Need for an Equipment Supervisor

Accordingly, it is important that a system officer have jurisdiction over work equipment, and his jurisdiction should include the assignment, distribution and repairing of the machines; the employment of operators, etc. This suggests a supervisor of work equipment, reporting to the chief maintenance of way officer. Without

Good Operator to the Goods



"A good machine and a good operator are a combination that produces results."



such a responsible organization it is not unusual to find in the spring that necessary repairs have not been made, or important parts are missing.

The supervisor of work equipment should therefore have his own organization for repair work, which could well be composed in part of the operators of the larger machines—men who are acquainted with the defects of their machines and who are responsible for their proper functioning during the working season. This arrangement provides a direct means for placing responsibility, and will likewise, in a large measure, provide that continuity of employment which is such a large problem on many roads in this country where uniform maintenance forces are not practical.

The problem of obtaining machine operators for maintenance work is one not easy of solution. There is no large group of men who are experienced in that work through practice and training that can be drawn upon. The extension of such machinery is as rapid as the training of men to run it permits. This means that each road must select and train its machine operators.

In general, runners of the larger steam equipment such as shovels, locomotive cranes, pile drivers and ditchers must be licensed and of considerable experience in the operation of their machines, and also have a fair general knowledge of construction methods. Most railroad companies have on their staffs trained men for this work and it is essential to keep such men employed, either as suggested above or in some other department of the railroad when not engaged with their machines.

Intermittent Employment an Obstacle

In the selection of men for the more routine equipment, such as tie tampers, welding apparatus, weed mowers and weed burners, a more difficult problem presents itself. Obviously the most intelligent and interested men available should be employed, but these will not be satisfied with intermittent work, and will finally gravitate to other positions where they can obtain continuous employment. The supervision of such men by the system officer provides the greatest means of stabilizing employment and permits the most rapid advancement to higher positions at any point on the system. The selection of such men from the section forces provides a most acceptable outlet for the better type of young men entering maintenance of way work. Young men with at least common school education, preferably unmarried, who are free to travel, should be selected. They should be returned to their sections or other positions when necessary, but advanced as opportunity offers so that there will be assurance that special qualifications are recognized. For certain operations it may be desirable to employ men who have not been engaged in railroad service, if their other qualifications warrant it, and they may bring with them new methods and original ideas.

The necessity of the proper training of men in charge of labor-saving equipment cannot be emphasized too strongly. It is not unusual to have machines costing several thousands of dollars assigned to inexperienced men with a superficial explanation of their workings, who are then turned loose to get along as best they may. A new machine should be placed in service

only as the operator is thoroughly schooled in its use, and the training of the operators is an important duty of the supervisor. In this way only can the economies of the apparatus be realized. Necessarily a new operator will increase in skill as time goes on, but the training should not be obtained at the expense of a gang of men.

The service life of any machine is largely a function of the care that its operator gives it, and in turn the output largely depends on his skill. The economies obtained from a maintenance machine depend on its output. Where the rate of progress of a large gang depends on the speed of a track-laying machine, the skill of the operator influences the cost of the day's work to a marked degree. It is therefore essential that considerable thought be given to this subject for unless the maintenance officers give it the attention and direction it warrants, the managements will not continue the liberal attitude that has encouraged the development of roadway machinery during the past few years.

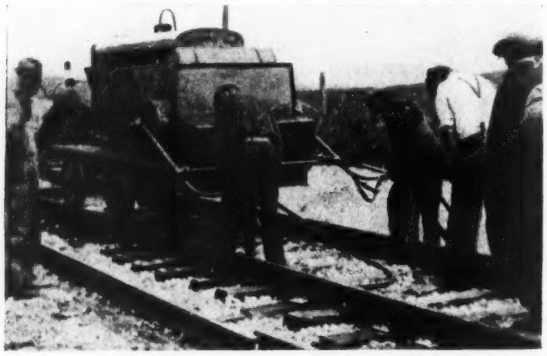
Good Machines and Good Operators

By W. H. KIRKBRIDE

Engineer of Maintenance of Way and Structures, Southern Pacific, San Francisco, Cal.

I BELIEVE that the keynote of this issue, "Getting the Most from Labor Saving Equipment," is a very important point to be considered by both the machine manufacturers and the railroads.

The Southern Pacific recognizes the value of labor-saving devices, and it has in the past and is at present adding to its list of such machines. For instance, the application of liquid chemical weed killer by a special weed-killer train in the spring of each year saves much



A Good Machine Requires a Good Operator

labor which was previously performed by the section hands. These trains, of which we have two, are in the hands of skilled operators whom we have educated for that purpose.

Likewise, we have modern rail-laying machines, to each of which a permanent operator is attached. We have a considerable number of track-lining machines, track-welding machines, pneumatic tie tampers, power bonding drills, gasoline shovels, ditchers and spreaders, as well as many other labor-saving devices.

The control and operation of these machines is under the immediate supervision of the supervisor of work equipment and the general track inspector. Operators selected by these officers to man this equipment are chosen for their mechanical ability and for their capacity to turn out work of quality and quantity. It is also expected that these operators take good care of the equipment entrusted to them.

We find that men of this character are, as a rule, real mechanics, that they take an interest in their work, and are quick to appreciate what the manufacturer is doing to put out better and improved machines. I believe that the manufacturer also appreciates this and is alive to the fact that the better the machine the better the harmony that will prevail between the machine and the operator, and consequently the better the impression that his equipment will make on the railroad. In other words, a good machine and a good operator are a combination that turns out good results.

Select Men from the Department

By C. E. MILLER

Supervisor of Scales and Work Equipment, Chicago & North Western, Chicago

IN THE selection of operators for motor-driven roadway machines, it is the desire that men be chosen who will get the maximum output from their machines, consistent with safe and careful operation. To achieve this result, it is more essential that the operator be active and alert in mind and body than that he be an expert mechanic. He must, of course, have sufficient mechanical knowledge and ingenuity to take care of of the routine needs of his machine properly, but he need not be a finished mechanic. Too often, the operator who is a mediocre mechanic considers himself as an expert and does unnecessary tinkering with the machine, which results in delay and a call for help before the machine is restored to its correct adjustment.

The operators of such machines should be selected from the ranks of the subdepartment in which the machine is to be used, as their qualifications are best known in their own department, they are more familiar with the work to be accomplished and are more likely to take a pride in striving to improve the showing of their own department by the efficient operation of the machine placed in their care. Men should be selected whose past records have proved them to be not only industrious, intelligent and susceptible to training, but to be well endowed with the spirit of safety. Any form of recklessness is intolerable in the handling of cranes or other machines where a moment of carelessness may result in fatalities, personal injuries or extensive damage to property.

Having selected as a prospective operator, a man having a good measure of the above qualifications, he must then be carefully instructed for a few days by the work equipment inspector or the factory service man, and be provided with the necessary instruction books. He should then be left to his own resources for a day or two and again visited by the instructor to see that he is following his instructions, and to give further instruction on questions which may have arisen in the operator's mind after his brief experience with the machine. After a few follow-up visits, the inspector should be satisfied that the machine is in safe and efficient hands or be convinced that the man will not develop into a satisfactory operator, in which case he should arrange for his replacement before his incompetency results in disaster.

Having developed a good reliable operator of a certain machine, it is, of course, very desirable to keep him in the service for which he has become fitted, but unfortunately this is not always possible for railways so located that the use of these machines is somewhat seasonal and some of them are tied up during the winter months. However, we arrange to use a considerable number of gasoline cranes, air compressors and other

mechanical devices on bridge work, ore-dock repairs, ice handling and other winter work so that many of our operators are taken care of in the off-season. The others, being temporarily assigned as operators, hold rights to their former jobs and return to them until again needed as operators.

Since the railroads have a large and increasing investment in labor-saving machines which will show very substantial savings if properly maintained and operated, it is essential that the railroads build up a competent organization to supervise and operate this class of equipment, and to program the work so that these machines and the operators may be employed for the maximum time throughout the year.

Recruit Men from Various Sources

By C. H. Ordas

Supervisor of Motor Cars, Chicago, Milwaukee, St. Paul & Pacific, Chicago

THE QUESTION of skilled operators for labor-saving equipment is quite a problem, and we are giving it considerable thought right at this time but have not come to any definite conclusion. Until now, we have had little difficulty in getting the type of men we needed for the operation of such special tools, because our needs were not very large. However, now that we may add to this equipment, it becomes necessary that we make serious effort to locate the right men for the work.

We prefer to use men who have been working on the railroad in some other capacity, schooling them in the new work and also trying to find some sort of work for them to do in seasons when the equipment is not in use. All supervisory maintenance officers will be asked to keep our needs in mind and when they find a man of the type we can use for this work we will try him out and put him to work on some machine. We have used some students in engineering schools during summer vacations who went back to school when our track work was finished and machines were taken off. We have also used some locomotive firemen and trainmen who were on the extra lists.

To operate this class of equipment requires men of the very best class obtainable, and serious thought should be given to obtaining the right men, but this can only be done by giving them year-round employment.

The Training Must Be Systematic

By G. M. O'Rourke

Roadmaster, Illinois Central, Carbondale, Ill.

IN THE selection of operators on the Illinois Central for such routine equipment as tie tampers as well as for heavier and more special equipment like locomotive cranes or steam shovels, the first requisite is that they must be in sound health. They must be free from physical, mental or moral infirmities, and must produce evidence of good character and ability. They must pass the required examinations before entering the service, and applicants for re-employment or reinstatement must undergo the same examinations as applicants for employment. Thus we are reasonably assured of the physical fitness required for work of good quality and normal quantity and the capacity for learning and clear thinking.

In every town and hamlet there is a garage today and the family—regardless of financial limitations—that is without an automobile is the exception. The use of motor-driven farm machinery is rapidly growing and these conditions are producing motor-trained young men, some of whom enter our service from every community. Therefore we have had no difficulty, so far, in finding qualified men with experience to operate our motor-driven machines. Many have worked in garages and some in railroad shops. They are selected from the gangs and in very few cases has it been found necessary to make a change, but supervisors are instructed that those who, from whatever cause, are palpable misfits must be eliminated at once.

Railway Experience Desirable

Operators of tie tampers, paint sprayers, mowing machines, discing machines and other routine equipment are selected on a seniority basis, experience and ability being equal. The many unusual situations springing up daily on a railroad make general railroad experience very desirable, because only from experience comes the self confidence necessary to meet the unusual. Experience must be held equally as important as fitness and education. Every man should be chosen with special reference for the machine he is to operate. There should be no "round pegs in square holes," regardless of seniority.

Operators Should Have Experience in Track Work

Care is taken that every man entrusted with a machine is thoroughly trained for its performance and is believed to be competent before the responsibility is placed upon him. He receives instructions from the manufacturer's representative when a machine of a new type is placed in service. We endeavor to have a motor-car maintainer—who repairs all motor-driven machines—present during the demonstration to listen to the instructions so that he will be thoroughly familiar with the operation of the device as well as with the machinery. Manufacturer's instructors are requested to stay with the operator until every duty is thoroughly mastered and the operator knows exactly what is required of him.

It is well to effect an arrangement whereby such machines as heavy rail layers and spreader ditchers will be operated by trained mechanics. Such machines, as a general rule, cannot be used continuously and when they are idle the mechanic can return to the motor-car repair shop or signal gang, thus assuring able men continuous employment. This scheme is particularly desirable on roads lying in latitudes where long and severe winters make their work seasonal. These men will bear in mind the importance of the responsibilities imposed on them and the serious consequences that might arise from any carelessness or dereliction of duty on their part. Given assurance of stead employment, they will do their best to hold a good job and, of course,

the more experience they obtain the more valuable they become. The output of a machine is affected to the extent of 25 to 33 per cent by the skill of the operator. It is recognized that uniformity in volume of work and continuity in operations are essential to maximum efficiency, therefore the machines should be used as much as possible and the operator kept employed. In the case of larger machines such as derricks, pile drivers, steam ditchers, etc., this can be accomplished by moving them from one part of the railroad to another, or from division to division.

Must Understand Machines Thoroughly

As operators of internal combustion or gas-electric equipment should be able to qualify on the general principles of internal combustion, including magnetos, carburetors, generators, storage batteries and both battery and magneto ignition, so in like manner should operators of heavier and more special equipment like locomotive cranes and steam shovels be qualified on boilers, lubricators, injectors, air brakes, etc. That we may be reasonably sure of this knowledge, our supervisors of work equipment and maintainers are charged with the responsibility of interrogating and instructing the operators and are constantly on the lookout for men whose latent qualifications may be developed to offset the decreasing supply of desirable men to fill subordinate positions. The entire supervisory force, from the foremen up, is instructed to be constantly impressed with the obligation of giving all the practical education possible to those under them and enrollment in special courses of railway education is encouraged.

The making of an operator for the larger type of machines is a slow process. These men, as a general rule, advance from pitmen, dumpmen or laborers through the grade of fireman and, unless exceptional, are required to remain on those jobs several years before becoming qualified operators. Thus the so-called "handy-man" is gradually taught to become a skilled operator.

Difficulty of Problem Increasing

The problem of obtaining competent operators will become increasingly difficult as the railroads put into use more labor-saving machinery and this is a point deserving careful thought and study. The suggestion is offered that during the busy summer season undergraduate students of high schools and colleges be employed in motor-car repair shops and as helpers about the larger machines, so that the systematic training of young men for the operation of maintenance of way machinery may be undertaken. If in due course they do not display necessary qualifications to combine practical and technical training they should not be retained. Foremen and operators should be taught that it is to their credit to develop good operators, and employees having the necessary qualifications should be given every legitimate opportunity and encouragement to obtain the required training and experience. Thus we may be reasonably sure of the economies, direct and indirect, that are to be obtained by having a trained force to perform our maintenance of way work, the same as we have for maintenance of equipment.

A successful machine operator is the man who is careful and safe. He must not only be constantly on the alert to protect himself but he is, in a measure, responsible for the safety of all the men working about the machine. He should be thoroughly familiar with the operating rules of the railroad as well as with the details of his machine and should be impressed with the importance of his responsibility in the prevention of personal injuries.

This discussion is based in part on information obtained from other roadmasters located at different places on the Illinois Central system. To them and to our supervisor of motor cars I express my appreciation.

Men Should Become Specialists

By J. B. MABILE
Supervisor of Work Equipment, Chicago, Rock Island & Pacific, Chicago

UNTIL a few years ago, the problem for the maintenance officers was to determine whether it was cheaper to do the work by hand or use machines. In general the machine won. Today, the problem is to determine which type of machine will do the work most satisfactorily and economically, and also be of use on enough different kinds of work to keep it in service the maximum possible time.

It is necessary that the machines be properly manned and that the men be trained. Most of our work-equipment operators are taken off the sections and are usually employed first to dump cars and help out around ditchers. They are usually young men who have just gone to work on the section, and the ditcher operators observe these young fellows closely so when in need of a fireman, we promote some one of them who has taken an active interest in the work and has shown ability.

After a man is put on in this way, we move him from one machine to another, placing him with our oldest and best operators to give him a chance to learn how to use the various machines. Men can be well trained for this work only by the combined efforts of the officer in charge of the equipment; the engineer, roadmaster or supervisor directing job on which the machine is at work; and our older operators.

To become a skillful operator of a piece of modern work equipment takes time. There is no substitute for long and careful training, and when a man has become proficient, he should be employed, as nearly as practicable, on one type of equipment. A "handy man," as the term is ordinarily understood, is of no value in operating these machines. In fact, the only place for a "handy man" is in the capacity of a work-equipment supervisor or inspector. A man in such a position should have a working knowledge of all the machines and be conversant with the railroad from the standpoint of the various classes of material to be handled and the local conditions.

The output from any machine used on maintenance work is governed by the condition in which the machine is kept and the skill of the operator. By assigning a man to a regular machine, the man becomes better acquainted with the machine, takes better care of it and soon learns to work the machine to capacity but without overtaxing it. The operator should make all minor or field repairs to his machine and when the machine is placed in the shop for general overhauling, he should do the tearing down and assist in the babbitting, filing, fitting and re-assembling.

It should be impressed on the operators that they are to give thought to the various kinds of work which they see being done by hand with the idea of suggesting ways of doing it quicker and cheaper with their machines. Some of the best savings that we have made, have come as a result of suggestions on the part of the operators.

Service men travel thousands of miles to insure proper performance of the various devices

How the Manufacturer Keeps Equipment Sold

What a builder of labor-saving machinery must do to insure repeat orders

NO AMBITIOUS manufacturer of labor-saving equipment is satisfied with the first order. His success must of necessity be built upon repeat orders. Such orders are possible only when trial installations demonstrate the economy of a device. It is, therefore, essential to his success that his equipment be so used on the railways as to demonstrate its merits.

The manufacturers of labor-saving equipment are constantly confronted with the experience that it is more difficult to get the employees in the field to use their devices than it is to prevail on executive engineering officers to buy them, and that repeat orders are frequently blocked by the failure of local maintenance employees to use the equipment already furnished them with reasonable efficiency. In spite of the fact that the major benefit resulting from the successful use of a labor-saving device accrues to the railway, many manufacturers have found it necessary to create special organizations and to adopt other measures to insure that their equipment is given an opportunity to demonstrate its economy.

The character and magnitude of this problem and some of the measures developed to solve it, are described here by manufacturers of wide experience in selling to this field. These articles afford much food for thought among railway men and constitute a constructive contribution to this subject.

Among the measures suggested is the warning of T. E. Rodman, sales engineer, P. & M. Company, Chicago, against overselling the customer. W. S. Miller, railroad sales manager, Northwest Engineering Company, Chicago, and C. Jackson, vice-president, Electric Tamper and Equipment Company, Chicago, stress the importance of thorough instructions to the prospective users as to operation and maintenance of the devices, while T. D. Crowley, sales agent, Cullen-Friestedt Company, Chicago, and "Sales Engineer," urge the railways to establish systems of supervision for work equipment.

Do Not Oversell the Customer

By T. E. Rodman

Sales Engineer, P. & M. Company, Chicago

LABOR-SAVING equipment is now generally understood to be a more or less mechanical means of saving manual labor. It must not only save labor, but it must produce equally good results. In track work especially, labor-saving devices should do the work better, faster, more economically, and with much greater uniformity than hand labor. Labor-saving equipment is of little permanent advantage, however—except for uniformity and quality—unless it is used long enough and often enough to keep its depreciation and interest charges at a reasonable minimum. It is obvious that labor-saving devices must be *money saving* devices as well.

It is of primary importance that labor-saving equipment be kept "sold" by not overselling the customer. Knowing what the machines will do, a manufacturer can suggest to the proper maintenance officers the correct number of units of a particular type of equipment to have at hand to do the work for the year economically in all respects; thus labor-saving equipment is not laid up, literally eating its head off in fixed charges.

The successful manufacturer maintains a well-organized service department to make periodic inspections of his machines in order to insure that they are properly maintained and are being operated at their highest efficiency. These service men should not

be considered as "trouble shooters" and machinery maintenance men by the railroads, but rather as inspectors for the manufacturer. They should report to him upon the condition and operation of the machines and upon the work performed. These service men are also frequently able to suggest new uses for the machines, thus giving such equipment greater operating periods.

Well illustrated diagrams and lists of parts, together with operating and maintenance instructions, should be in the hands of the local maintenance forces at divisional headquarters and in the purchasing department. It should be the duty of service men to see that all interested persons are familiar with the maintenance and operating instructions, and that the proper officers know that these instructions are followed. This is particularly important when a machine is moved to a division upon which it has never been used.

It is best to furnish as little actual servicing as possible so that the local railway forces will equip themselves to do their own servicing and not delay work pending the arrival of a manufacturer's representative.

Applies Also to Track Appliances

The same general plan should be followed in keeping track appliances sold. Depreciation and interest continue just the same as with working equipment which saves labor. Here the labor cost of application, maintenance, removal and reapplication is one that should be kept before the proper officers. These officers should be urged to keep close records of such costs so that when additional orders for these devices are pending, the actual cost in track, including the labor of application, life, depreciation, etc., and above all, performance, can be fully taken into account. Such material can be kept "sold" by reporting regularly to the user on the condition of the appliances and of their continued performance in track. The economy of reapplication can also be urged. For example, when rail sizes are increased, the old appliances instead of being scrapped, should be used again and again in other locations where rail of the old size is in service.

A Great Deal Depends On the Supervisory Officers

By W. S. Miller

Railroad Sales Manager, Northwest Engineering Company, Chicago

EVERY maintenance engineer fully realizes that it is one thing to place a power labor-saving device in the hands of a work crew and still another to keep this machine in effective operation.

If operating records are not satisfactory and the economies shown do not measure up to those anticipated at the time the machine was recommended for purchase, there is a very distinct reflection upon the good judgment of those executive and subordinate officers who were responsible for the installation, even though their decision was made after an exhaustive study of performance records of similar devices in service on other railroads. This unfortunate reaction may also carry through to the manufacturer who built the machine and whose representatives furnished information on which the engineers based their judgment for recommending the machine for purchase.

There are many things which may contribute to the failure of a machine in service. The first of these is probably the lack of specialized supervision by some one individual equipped by training and experience to select good operators and keep the equipment under his jurisdiction in good operating condition. Many railroads now have one or more supervisors of work equipment who have assigned to them the responsibility of keeping a certain number of machines in running condition. He has the authority to select and direct his own organization of operators and mechanics. He also has full charge of spare parts for his equipment so that early shipments can be made to operators in case of breakdowns. As a result, he holds the confidence of his men, for they know that when they wire for repair parts or other supplies, these will be forthcoming without the delays which are sometimes occasioned when no one person has the authority to order them out. Many a worthwhile machine has shown a poor record in actual hours of performance because of time lost through delays in shipping repair parts and because of mechanics on the job who are incompetent to install the parts after they do arrive.

Another reason for the ineffectiveness of some mechanical device in maintenance service is the failure of the manufacturer to place before all interested persons complete information regarding the use and care of these machines. If a man has been using a hoe for moving dirt, he will never be convinced that he can do more work with a shovel until some one demonstrates this fact conclusively. Most of the progressive railroads are using air or electrically-operated tie tampers, but there are a number of roads who are still adhering to the old custom of hand tamping because the roadmasters have not been convinced to the contrary by manufacturers' representatives. The engineering executives hesitate to force a change until the supervisory or division officers themselves request it, because they know quite well that the mechanical tampers will be set aside if the first results are not satisfactory.

In order to get the most from labor-saving equipment, the first duty of the manufacturer who has a worth while piece of equipment to offer for service is to sell the advantageous application of their machine to every one in the organization who will be affected by its performance from the machine operator to the operating vice-president. The next duty of the manufacturer is to furnish competent instructors to work with the operators for a sufficient length of time to ground them thoroughly in the care and operation of the machine. Supplies of spare parts should be available at such points that delivery can be made within 12 to 24 hours, and the operator should be able to supervise the making of ordinary repairs without calling upon the manufacturer, thus avoiding delay.

Operators should be selected by the supervisor of work equipment and chosen for their ability to handle certain types of machines. For example, it might be a mistake to put a man advanced in years on a fast moving piece of equipment that could be operated to better advantage by a younger operator. If the supervisor of work equipment has been wisely picked, he will know how to put the right man and machine together.

Manufacturers should have a perfected inspection system with experienced men checking up the machines three or four times a year to see that the operators are not getting into bad habits in taking

care of their equipment. The life and performance of a piece of machinery depend upon the treatment it is given. Proper lubrication is one of the first considerations and if one vital frictional area is allowed to run dry through oversight or neglect on the part of the operator, he will not be likely to admit this to his superior, but in all probability will blame the machine in order to safeguard his interest. It is, therefore, to his own advantage that the manufacturer institute and regularly follow through a rigid inspection system, which will go a long way toward keeping the machine sold and toward selling other machines by justifying the confidence evidenced by the engineers who first recommended the equipment for purchase.

Operators Must Be Instructed

By C. Jackson

Vice-President, Electric Tamper & Equipment Company, Chicago

THE manufacturer of power-operated maintenance of way appliances, particularly that class of portable machines or tools operated by the individual workman, is confronted with a unique, difficult and continuous problem. His very business existence depends wholly upon repeat annual orders from a limited number of customers. To assure this continuity of new business, keeping the equipment "sold" is a matter of first importance as it is immediately apparent that failure of the equipment to make the savings expected, to cover a satisfactory number of track miles throughout the season and, in general, to come up to the full expectations of the railway officers, makes future business doubtful indeed.

Several years of expensive and at times discouraging introductory work are necessary before a manufacturer can really determine the best method and procedure to be followed in keeping mechanical tools operating to a degree of efficiency sufficient to thoroughly satisfy the various railways who install the equipment during the introductory period.

The fact that these tools must be operated by ordinary track laborers, most of whom are skilled only in the use of the pick, shovel or lining bar and that the various gangs to whom these tools are assigned are organized for hand work without power-operated machines of any sort, means that the problem of the manufacturer is one of gradual education and the evolving of new methods and gang organization.

"Machine Gangs"

The most satisfactory solution of the problem is the organization by the railway company of "machine gangs," that is, the training of extra gangs or larger section gangs in the use of power-operated mechanical appliances. Since the men in gangs of this kind are not skilled mechanics, the most successful users of mechanical tamping equipment employ one competent operator who is directly responsible for the mechanical condition of the equipment in his care. He attends to minor field repairs, keeps the plant properly oiled and clean, and also instructs the individual workman in the best method of handling the tools. Some railways employ one operator who has charge of 15 to 20 tamping units and makes periodical inspections of each plant. Other railways employing large extra gangs, assign an operator to each gang, the operator usually having ample time on his hands to act as assistant foreman and otherwise make himself useful.

The most disastrous procedure from the standpoint of both the railway company and the manufacturer is to turn over mechanical work equipment to gangs without previous experience in their operation and care. We keep a very careful check on every plant sold and employ a corps of men who endeavor to visit every plant at least once each 30 days throughout the working season. These service engineers come in contact with all sorts of methods and gang organizations on many different roads and they are instructed to coach the foremen and operators of the plants, give all information possible, assist in minor field repairs if necessary and turn in a complete report as to the mechanical condition and operation of each plant inspected, one copy of this report going direct to the railway officer in charge of work equipment.

Should Be Overhauled Annually

Another point we recommend is that the railways carefully check and overhaul power units and tools during the winter months. This work properly done means that when the equipment is sent to the various gangs in the spring it is in first class operating condition for the working season. We not only make it a point to encourage this practice, but upon request, send service engineers to the various railways to supervise the overhauling of the equipment. Fortunately many railways now send all work equipment into their general shops during the winter months where ample skilled help is available.

Keeping equipment "sold" means that the manufacturer, under all circumstances, must keep close touch with every piece of his equipment, regardless of the number of years it has been in service and see that it operates at full efficiency at all times. He must co-operate closely with the railway companies in this work, discuss their problems with them, and if the apparatus is fundamentally good and possesses merit, these measures, if carefully observed, will keep the equipment "sold" and he will enjoy the confidence and good will of the various railways, which in the end means continued business.

Possibly the word "service," when considered in its broadest sense, sums up the entire answer.

Railroads Should Provide a System Supervisor

By T. D. Crowley

Sales Agent, Cullen-Friestedt Company, Chicago

IN ORDER to get the most from labor-saving equipment, it is vitally important that each machine be kept in operation on productive work as much of the time as possible. Each piece of equipment has a certain value and is subject to annual depreciation and interest charges whether working or idle.

It is equally important to make sure that all machines are used properly and are used on the particular class or classes of work for which they are designed. It has been my observation that certain devices which are really capable of making very marked savings in labor costs are sometimes used so improperly that they showed little or no saving on their operation. This condition, of course, is either due to lack of supervision or to the fact that supervisory officers are not thoroughly instructed in the

use of the equipment. Under such conditions, labor-saving devices are of little or no value and the failure to show savings is very often unjustly laid to the equipment.

Keeping roadway machinery in repair is another very important factor to be considered, because run-down or dilapidated equipment is subject to frequent breakdowns that often inflict severe losses on the railroad by tying up a large gang of men. Roadway equipment, like rolling stock or any other machinery, must have periodical mechanical attention, although some roads seem to neglect or overlook this fact entirely.

Need of a Supervisor of Work Equipment

It seems to me that inspecting, adjusting and making general repairs to labor-saving devices can be handled most efficiently by a department created particularly for that purpose. One road I have in mind has a supervisor of work equipment who is in charge of the maintenance of all roadway equipment on the entire system. The supervisor of work equipment has four or five inspectors or mechanics working under him and all these men are thoroughly familiar with each labor-saving device used by the road and they are, therefore, in a position to make repairs promptly and correctly. The inspectors are located at strategic points on the road and each inspector personally supervises and is responsible for the satisfactory operation of all equipment under his jurisdiction. Each inspector takes care of all field repairs, and advises his superior officer when he thinks it necessary to send a machine to the shops for major repairs.

The upkeep of such a department may appear, at first, to be very expensive. This, however, is not the case on the road which I have in mind because this company, by keeping its roadway equipment in good condition, has eliminated the possibility of frequent breakdowns and consequent loss of time to track gangs. The supervisor of work equipment is also called upon to pass judgment on the purchase of all labor-saving devices and, because of his experience with this class of equipment, he is exceptionally well qualified to pick out the fine points as well as the flaws in the construction of various machines which the road contemplates purchasing.

Scheduling the Use of the Machines

The supervisor of work equipment is also an important factor in working out programs to keep labor-saving equipment in operation a maximum number of hours. Working in conjunction with the engineer maintenance of way, he can outline work programs and schedules so that the devices needed on a certain job will be available and will be in good working order when the job is started. On the particular road referred to, the supervisor of work equipment knows just when every machine will be in operation, and in this way is able to work out a repair schedule for all machinery so that it will not be necessary to make heavy repairs on any equipment when it should be in operation.

Still another important function of the supervisor of work equipment is the instruction of track forces in the operation of equipment which is being used on a division for the first time. When a new rail-laying crane is shipped to a road, we always make it a point to have a man on the ground for the purpose of explaining fully the operation, care and lubrication of the crane and it is, therefore, equally important that similar instructions be given when the crane is loaded up and sent to another division where the supervisory officers are not familiar with its operation.

Equipment of this type represents considerable investment to the purchaser and for this reason should be given proper care and attention. Selection of operators is, therefore, important because an operator who is interested in his work and knows how to care for his machine can save the railroad considerable expense. I believe it is advisable, when breaking in a new operator, to pick a man having mechanical experience as well as a general railway background, as these qualifications are important both for the operation and care of the equipment. Frequent changing of operators is usually harmful to any machine and, while it is sometimes impractical to assign one man to a certain machine, this practice should be followed wherever possible.

Getting the Most From Labor-Saving Equipment

By Sales Manager

IN RECENT years, there has been a tremendous impetus in the development of labor-saving devices for track work. Many railroads are eager to adopt any tool that has really proved itself; yet frequently, after the tool has been investigated, bought, and put into service, only a little time elapses before it is hidden away. This often means converting a good investment into a frozen liability. Indirectly, this retards the adoption of improved labor-saving devices.

There are three cardinal points to be established before a machine can be operated with the greatest degree of success: (1) It must be operated correctly; (2) it must be used whenever and wherever it can be of *economical* service, and (3) it must be kept in proper repair.

For the best results, co-operation between the manufacturer and the railroad is essential. Progressive manufacturers recognize this principle and insist upon sending out their experts with the machine. This practice is continued until the operator, be he a section hand or a foreman, has thoroughly familiarized himself with the device. It is felt that until this is done, the men in the field will be prejudiced against the new methods and will instinctively follow the old rutted path. However, the expense of this instruction and supervision comes under the head of development cost and cannot be considered as anything but an introductory measure of short duration. Eventually, the responsibility for the proper utilization of any equipment is strictly up to the railway officers themselves.

Necessity for Keeping Equipment at Work

That economies can be effected by the use of modern devices has been demonstrated many times; in fact, so often that it is no longer a debatable question. It has also been shown that the saving is largely proportional to the degree of interest taken by the individuals most directly concerned. The foreman, the supervisor, or even the division engineer can often, for the time being, either "make or break" a piece of equipment on his particular road. Aside, then, from the question of first cost, the development

of better maintenance methods through the increased use of modern equipment hinges very largely on the maintenance men themselves, from the division engineer down. If poor showings are made because of indifference or prejudice, the adoption of labor-saving tools is retarded and possible economies delayed.

A conspicuous example of this has been the development of the mechanical tie tamper. Where maintenance men have become interested in them and have accustomed themselves to their use, these tools have made good—have paid large dividends on the original investment. General maintenance work has benefited accordingly.

Keeping It in Good Condition

The use of labor-saving devices has been a great factor in overcoming the inefficiency of present-day labor. The use of these devices to the best advantage is a responsibility which falls on the shoulders of the supervising officers. There are some who are inclined to look askance at a new device. In some cases the attitude is, "Let someone else develop and perfect its use." There are others who, knowing that they have always done their work with hand labor, feel that it cannot be done as well any other way. When labor-saving devices are placed in the hands of these men, inferior results are the natural consequences unless something is done by the supervising officers to overcome this prejudice. On the other hand, many roads have not devoted sufficient attention to the proper maintenance of new machines and to the instruction of their men. It is but fair to the workmen that an organization be established for the care of the tools, thus making them constantly available. In addition, the workmen should be instructed in the proper use of machines. How else can they be utilized to their fullest advantage? Even with such an organization, little can be accomplished without the sympathetic co-operation of the foreman.

One of the first essentials to the proper maintenance of equipment is its care in operation. As a matter of fact, the cost of maintenance and the time that such equipment is out of service for repairs are determined very largely by the manner in which it is operated. Too much emphasis cannot be placed upon the question of proper operation; for no matter how efficient the machine may be, its maximum efficiency cannot be obtained if it is operated in an indifferent manner and without regard for the details essential to its satisfactory performance.

The lack of proper care, the use of improper oil for lubrication, the failure to lubricate properly, the neglect of small details (such as bolts, connections, etc.)—all these are responsible for much of the repair work and delays encountered with the average labor-saving device. This is particularly true where an internal combustion engine is the original power source; for while the modern gasoline or oil engine is a reliable prime mover in proper hands, its satisfactory performance is dependent almost entirely on the manner in which it is handled.

In general, the labor-saving equipment used on any railroad is reliable if properly treated. Almost without exception, failures can be traced directly to indifference, neglect, or ignorance on the part of the operator. Regular inspection and adjustment of the component parts must be observed at frequent intervals. This is one secret of successful operation. Proper inspection goes hand in hand with efficient service.

Give proper instructions for maintenance and operation, and see that your machines are started off under proper and favorable conditions. "Of all impressions made upon the human mind, the first impression is the strongest and most lasting." If a machine starts off properly, there is an excellent chance that it will continue in a satisfactory manner, provided the operator and the owner have been properly instructed in its use.

Economies are necessarily calculated in terms of labor saved. Since labor is figured on an hourly basis, the value of a new machine or plant must be considered in the same way. Therefore, the total saving that can be effected depends directly on the hours of useful work which the new facility can do in a year. This same process of reasoning must be applied to any equipment bought to reduce maintenance of way labor. But do the men who have the use of such equipment always think of it in the same way? The interest on a unit of working equipment continues to accrue, whether or not it is in use; but the savings are effected only when it is actually at work. A spreader or a crane, for example, is of value only when it is earning a return on the investment made in it.

In the maintenance of way departments, almost all supervisory officers are displaying an interest in labor-saving equipment. It is to be assumed, therefore, that they will exert every effort for the success of those devices placed in their territories. With the foreman, the matter is not so clear. The new device implies greater responsibility on his part, both as to its care and its successful performance. In other words, more will be expected of him; and it can be said, in truth, that the sooner the machine is abandoned the less he will have to worry about. This statement, of course, does not apply to the man with sufficient foresight to see beyond his present position; the man who perceives that his capacity for increased responsibility places him in line for something better. Nevertheless, this is an attitude which cannot be overlooked.

Next to be considered is the man behind the gun—the one who, in the end, must be depended upon for actual results. Although the labor-saving device reduces the number of men required to perform a given amount of work and, in most cases, requires less arduous physical labor on the part of the operator, it does entail more alert action of the mind. The man must be "on the job" to see that the machine is working properly; to detect any defects before damage can be done; and to see that his tool is kept in operation constantly.

The typical common laborer finds it much more comfortable to keep droning along with a minimum of mental effort, even though he is compelled to put a greater burden on his back and his muscles. It is vitally necessary that men be instructed on the proper care and operation of their tools. Time and money spent on this subject will be returned many times over in the savings effected by their use.

Selecting and Training Operators

The greatest care should be exercised in choosing the operators and crews of work equipment. The failure of equipment, particularly on the larger jobs, often means serious delays; often means the loss of time and money instead of the expected economies. The uninterrupted operation of any machine or piece of equipment requires a certain amount of maintenance in the field. Minor repairs may be made without taking the machine out of service. This work

can be done by the regular field maintenance man, or better still, by the operator himself. In choosing men as operators, it is important to select those who will be capable of handling these details of field maintenance.

On this important point of "keeping equipment sold" manufacturers will rarely go astray if they adhere to the following tenets:

1. Supply equipment that is thoroughly satisfactory in the matters of design, workmanship and materials.
2. Render a "service that wins." Maintain a thorough service organization, and systematically follow up equipment in the field.
3. Maintain a complete stock of spare parts at readily accessible points.

Do the Railroads Expect Too Much?

We sometimes wonder whether the railroad officer in charge of construction and maintenance equipment does not expect too much of the manufacturer. Some apparently feel that any labor-saving device, once it has been placed in service—with even the most perfunctory demonstration to the men—will immediately begin to pay dividends on its purchase price. It is not surprising, therefore, that they are surprised, disappointed and even disgusted when they find that their expectations are not realized.

Most reputable manufacturers maintain an extensive service organization—always a heavy item of expense. Service engineers are sent, without cost to the customer, for the purpose of installing the new equipment and breaking in men for the care and handling of the machines. Manufacturers realize, of course, that the introduction of new devices gives rise to many problems for the railway organization. This applies particularly to the men of the track department, who are not expert mechanics and are scarcely expected to be. Many of them are not accustomed to the use of power tools.

It is frequently found that many service calls are unnecessary and originate in some minor difficulty that could have been overcome by the men on the job. Much of this trouble could be eliminated had the operator been properly instructed when put in charge of the equipment. As an instance:

A prominent manufacturer received the complaint that one of his machines was not functioning properly. A service engineer was immediately dispatched to investigate and correct the trouble. He found, upon examining the machine, that the intake had been entirely closed with a pipe plug. The service man voiced his astonishment to the operator. "Well," said the latter, "the boss told me no open end pipes; I found this one open and closed it with a pipe plug." This might have caused serious damage to the machine, had these people not had the good judgment to stop it until the arrival of the service man.

In general, it is not felt that service on the part of the manufacturer is being overdone, or that the privilege of using this is being abused by the railroads. Manufacturers are glad to render service, which has been a vital factor in extending the use of labor-saving machinery. However, it does seem that certain of the railroads would get more out of their equipment by exercising a greater degree of supervision on their own part.

The manufacturer of railroad equipment in this country have helped a great deal to advance the science of railroad construction, maintenance and operation. Their engineering staffs and their officers have spent years of study to develop the most finished devices for labor-saving and for safety. This has cost many thousands of dollars. The manufacturers are proud of their accomplishments, and gladly stand behind their products. In the hope of advancing the industry, they give freely of this knowledge—often without regard to monetary reward. But frequently they must ask themselves: Has this been properly appreciated?

For instance, the engineering department of a large railroad calls upon a manufacturer for advice. The manufacturer places in the hands of the railroad his entire resources and stock of information. Time and study are necessary to ascertain facts upon which to base specific recommendations. The railroad fully appreciates this; but when the new equipment is ordered and bids are requested, the special service is not taken into consideration. The contract goes to another company, which has just entered the field and is lacking in this practical experience. Quite possibly, the first price might be slightly lower; but will the final result be the same? Is it not possible that the first manufacturer, seasoned by years of actual experience, will be able to deliver a more satisfactory product on which the ultimate cost will be lower and render a superior service?

Conclusion

Without doubt the next few years will see a material increase in the use of labor-saving devices. Supervisory officers will find it less difficult to get their work done *satisfactorily*, despite the prevalence of inefficient labor. Many who were once seriously prejudiced against the use of certain devices have completely changed their views after a year's successful operation. This, we believe, can be accomplished even more frequently in the future, through better co-operation between railroad supervisory officers and the manufacturers of railroad equipment.

Big Four Roundhouse at Riverside Terminal, Cincinnati, Ohio

Where Are We Heading?

A few glances into the future, forecasting the trend of developments in the next five years

DR. JULIUS KLEIN, director of the Bureau of Foreign and Domestic Commerce of the United States Department of Commerce, said recently that no industry will progress very far whose officers are not looking at least five years into the future and planning for that period. The use of labor-saving equipment is growing so rapidly that alert railway and railway-supply men must of necessity give consideration to its future trend and development if they are to be prepared to meet these developments most efficiently.

Will future development in labor-saving equipment be more largely in the introduction of new devices or in the more intensive use of those that we now have? Will the trend be towards specialized or general service machines? Will the equipment of the future be of such a type as to require the use of a track or will it be designed to work independent of traffic? Does the development in the use of alloy metals offer possibilities? Can we expect a machine to renew ties, the operation that now makes the largest single drain on the time of maintenance of way forces? Will the increased use of labor-saving equipment be reflected primarily in a reduction in the amount of labor required or will it be evidenced through the maintenance of better track by the present forces?

These are some of the questions that arise when one attempts to forecast the future. They are discussed in the articles which follow.

Further Development in Air-Operated Tools

By T. T. IRVING

Chief Engineer, Central Region, Canadian National, Toronto, Ont.

I LOOK for further development in the use of air-operated equipment in maintenance of way work during the next five years, particularly in connection with the cleaning and painting of steel bridges. I also see no reason why practically all painting of buildings cannot be done more economically with paint-spray equipment than by present methods.

A 25 Per Cent Reduction in Labor

By A. A. MILLER

Engineer Maintenance of Way, Missouri Pacific, St. Louis, Mo.

ON THE assumption that we will move as quickly and as progressively in the next five years as we have in the last five years, it is my thought that if we rate the present utilization of labor at 100, we can expect to see labor rated at 70 to 75 in 1934. Putting this in another way, I have in mind that if 100 hours of labor are being used at the present time to accomplish a certain result, in 1934 the same work will entail from 70 to 75 hours of labor, the remainder of the result being obtained through labor-saving devices.

Considering our own railroad, I would say that what we have done during the last five years in the way of constructing and making use of labor-saving devices in maintenance of way and structures work warrants this prediction,—that the next five years will see the replacement of 25 hours out of a possible 100 hours of man labor by the labor-saving devices.

The Future in Bridge Work

By G. A. HAGGANDER

Bridge Engineer, Chicago, Burlington & Quincy, Chicago

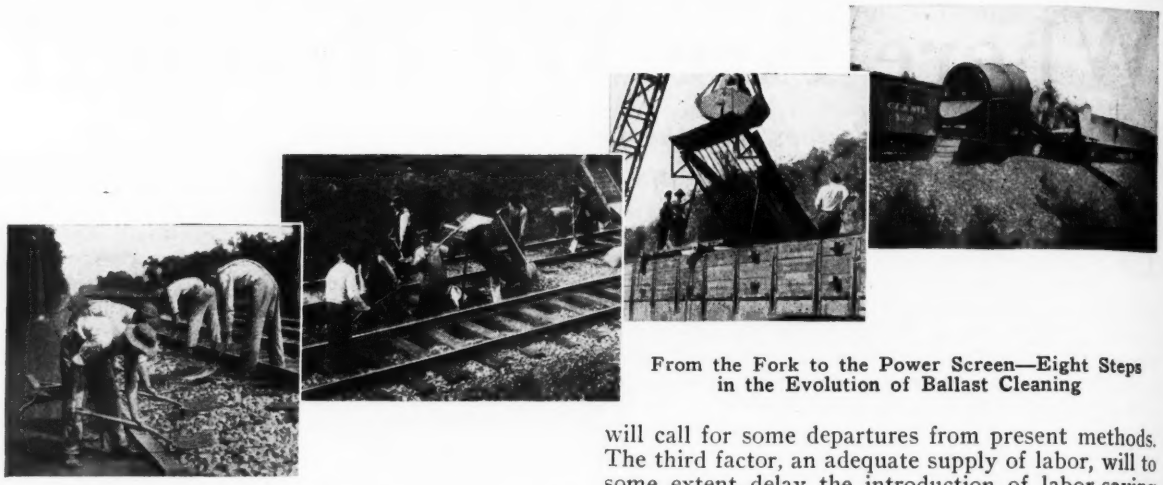
IT IS my opinion that the developments in the construction and utilization of labor-saving equipment during the next five years will be more along lines of greater utilization of present classes of equipment than the development of new types of equipment.

On steel bridge work we now have, and have had for some time, the proper kind of derricks, air compressors and air tools. I would like to see a one-man rivet buster developed which will cut ⅞-in. rivets. This type of rivet buster now in the market will handle ¾-in. rivets nicely, but the ⅞-in. rivet is a little too large for it. An improvement can be made in the derrick service by the use of high-speed, self-propelling derricks to replace the machines now in general use which have a traveling speed of only about five miles per hour.

On timber bridge work we now have about all of the tools necessary for economical handling, but there remains a big field for the increased use of these tools. All piling should be driven with high-speed, self-propelling pile drivers, thus eliminating slow movements and the use of work-trains. Heavy timbers should be handled with rail layers instead of by hand, and all boring and framing should be done with air or electric power-operated, cross-cut saws, small circular hand saws and boring tools. The development of power-operated sawing outfits is very recent and this type has not been generally adopted. Endeavor should be made to program work so that rail layers can be used on timber bridge work at a time when they are not needed for rail laying. I am not yet certain that the purchase of these machines for bridge work alone will be justified, but they certainly are economical when they are already on hand and the first cost is not to be considered.

Concrete Equipment Highly Developed

There is but little improvement that I can foresee in the equipment for handling concrete work. We now have first-class facilities of handling cofferdams, pile driving, excavation, form building and concreting, providing the machinery available is used. Quite a development is under way in the jacking of culverts through fills instead of installing them in the open trenches. The importance of not disturbing the roadbed and putting on slow orders is so great that this method is being adopted even in some cases where the expense involved exceeds that of the open-trench



From the Fork to the Power Screen—Eight Steps in the Evolution of Ballast Cleaning

method. I look for the extensive use of this method of placing culverts.

In our bridge painting work we need a better method for cleaning rusty steel than we now have. The use of sandblast outfits is slow and expensive. No wire brush or scaling tool developed thus far seems to be satisfactory for removing the heavy scale, but I think something can be worked up along this line.

In reinforcing existing bridges, especially where weakness is due to bearing on flange rivets, extensive use will be made of electric welding. I think developments along this line for the next few years will be mostly in repair work and not in newly fabricated work.

In general construction work, more gasoline-driven equipment, such as hoisting engines, power pumps, air compressors, etc., will be used to do away with boilers and heavy equipment which are still being widely used today. The use of caterpillar drag lines, clamshells, etc., will be increased on the work where they can be employed and where they will not interfere with traffic, instead of using machinery mounted on railway trucks.

Two or three years ago our chief need was the development of power machinery for framing pile-trestle bridges. Since this need has been filled it is difficult to find any class of work which cannot be properly handled with the present classes of equipment.

Interference with Traffic to be Considered

By F. R. Layng
Assistant Chief Engineer, Bessemer & Lake Erie, Greenville, Pa.

IT IS believed that in the next five years railway managements will concentrate their attention very definitely on increasing the speed of passenger and freight trains, and that any delays to trains caused by construction or maintenance operations will have to be practically eliminated. It is also believed that during the next five years, due to the revolutionary changes in industry and in agriculture, there will be a relatively adequate supply of labor. If these assumptions are correct, we will be confronted, within the next five years, with two factors that will demand much higher standards of construction and maintenance than we are now accustomed to, and which will call for some departures from present methods. The third factor, an adequate supply of labor, will to some extent delay the introduction of labor-saving equipment. It is also believed that a further factor tending to prevent a more rapid introduction of labor-saving equipment is the fact that most railroads, especially in the north, have never worked out a program for doing their work on other than a seasonal basis. This method of carrying on construction and maintenance work means that for several months each year mechanical devices are idle, which results in an uneconomical investment in plant.

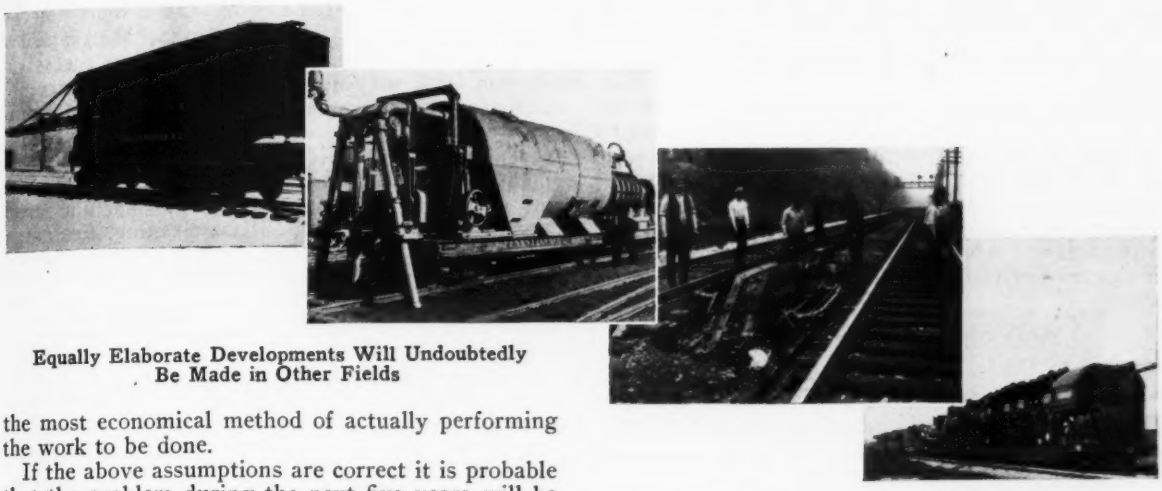
Construction a More Favorable Field

In new construction the use of labor-saving devices will probably make greater progress than in maintenance work, due to the fact that construction work can generally be carried on with less interference to the movement of trains than can maintenance work. A factor that will speed up the use of labor-saving devices on construction work in the future will be the element of "interest during construction," and another influence in this direction is that construction work is generally carried on by contractors who are not restricted in their introduction of new machines or methods to the same extent as are the railroad companies themselves.

In maintenance work certain labor saving devices have already proved their value and the problem in the next five years, as I see it, is to adapt those machines which have established themselves to the new conditions that will have to be met.

It is not believed that within this period very many additional labor-saving devices will be developed that will radically change present methods and it will not be surprising if, in meeting the demands for increased speed of traffic, it will be necessary to use less machinery and employ a larger number of men. In other words, in the use of many machines that might be developed, we are stopped by reason of the fact that in their operations they work on tracks that are in service. If the machine cannot be quickly removed from the track so as to permit the free flow of traffic the economy gained in performing the operation in question is largely lost due to the interference with trains. This conflict as between the economical performance of a certain kind of work and the free flow of traffic is bound to slow down and, in many instances, prevent the use of labor-saving devices.

The problem then, as I see it, will be to adjust ourselves in the carrying on of maintenance operations to the idea that the free movement of trains must have precedence, and maintenance operations must be performed with this in mind rather than with a view to



Equally Elaborate Developments Will Undoubtedly Be Made in Other Fields

the most economical method of actually performing the work to be done.

If the above assumptions are correct it is probable that the problem during the next five years will be to utilize those machines which have demonstrated their economy and which at the same time do not delay traffic.

Intensive Use of What We Have

By J. B. MARTIN

General Inspector of Track, New York Central, Cleveland, Ohio

IT IS a truism that the substitution of machinery for muscle has solved many problems, and the introduction of mechanical devices into railroad construction and maintenance work is helping to solve the problem of how to secure stronger and better maintained tracks and structures economically to meet the requirements of present-day transportation. The past few years have seen the adoption of a wide variety of labor-saving quipment that covers practically every phase of track, building and bridge construction and maintenance, ranging from the small power bonding drill to the "mile-a-day" ballast-cleaning machines. The next few years will undoubtedly see further development and improvement of this equipment and a wider application.

Railroads cannot afford to invest considerable sums in equipment unless they are pretty definitely assured that it will produce a saving after taking into consideration the investment, depreciation, maintenance, etc.; after this is established there should be no good reason why equipment should not be utilized for all work in which it will show economies, but the question then arises as to how efficiently and fully it will be employed. I believe that the greatest advancement that will be made with labor-saving equipment in the next five years will be through the more constant and intensive employment of each piece of equipment.

This will be brought about in part by educating the field forces in the best methods of handling and using each device to get the maximum results. It will be encouraged also by better maintenance. This involves the education of the field forces in the proper care and use of the equipment, a thorough method of inspection and an organization that will take care of the repairs efficiently and economically. Equipment that is idle through breakdowns disrupts the organization and represents a definite loss.

Of great importance is the planning and programming of the work so as to get the greatest use and benefit from the equipment. Today it is in storage or standing idle too great a part of the time, due, in some measure at least, to the lack of a definite and well-considered program, and its use cannot be extended greatly and further investments made until means are found to keep it more fully employed. Consideration should be given to a proper co-ordination of labor-saving equipment with the methods of organizing the different classes of work. Perhaps there is a tendency to use twentieth-century equipment with nineteenth-century organization.

It means a thorough study of requirements and a definite program for the work and activities over a period of years to meet these requirements. It means a program not alone for the section or division but for the entire line or system.

Must Develop Mechanical Sense

By A. C. MACKENZIE

Engineer Maintenance of Way, Canadian Pacific, Eastern Lines, Montreal, Que.

THE development and utilization of labor-saving equipment depends largely on the development of what might be called the "mechanical sense" among maintenance of way officers and men. By this I mean development of the same familiarity with the construction and operation of portable power units as the average man has with his automobile. Once this "sense" has been obtained we can expect to see the decreasing use of hand-operated tools for track, bridge and building maintenance and their replacement with power-operated equipment.

As the use of the various alloy metals of high tensile strength becomes general, it is to be expected that power units of such weight and cost will be developed as to make it possible to apply them to ordinary maintenance work, so that much of the work now done by hand will be performed more efficiently and economically by mechanical means. The present tendency towards ever increasing wheel loads and speed will call for higher standards of maintenance which will be realized rather by the increased use of mechanical labor-saving devices than by an increased force.

Steel structures and their maintenance will receive special consideration; electric welding will be developed extensively for the building and maintenance of railway structures. This will involve the design of special portable equipment. The art of building up battered rails by welding will certainly be im-

proved and we may expect to see the development of automatic or semi-automatic welding machines and fully automatic surface grinding and trimming machines.

We may expect the increasing use of our excellent highways by the railways for the delivery of material and plants by truck along the line instead of by train service. One of the most promising fields for the development of labor-saving equipment in North America is in the removal of snow and ice from railway yards and terminals, and considerable development in this class of plant may be expected.

General Service Machines

By L. B. Allen

Assistant to Vice-President, Chesapeake & Ohio, Richmond, Va.

THERE are two outstanding reasons for substituting machinery for labor. One is necessity and the other economy. The factor of economy is always of prime interest in railway operation and even though there is a plentiful labor market, the railroads will encourage the development of labor-saving machinery where economies can be obtained. The next five years may see no very great change in the labor situation, though there will probably be a trend toward diminishing supply. The development and use of labor-saving machinery has progressed during the last five years and has helped maintain the balance in labor supply and demand. The same condition will no doubt maintain during the next five years. The present equipment will, no doubt, be improved and its use extended. However, there will probably be no startling developments in the production of new ideas and devices.

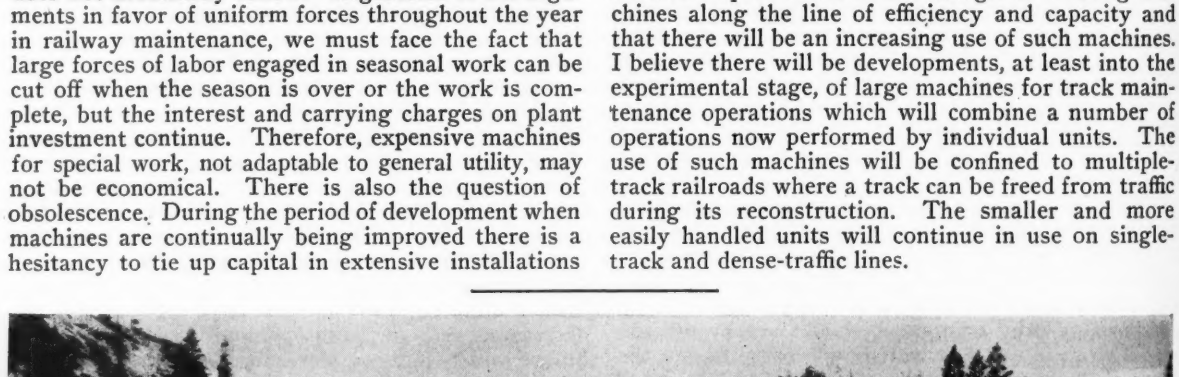
Economy in the use of all labor-saving machines does not necessarily follow. Regardless of the arguments in favor of uniform forces throughout the year in railway maintenance, we must face the fact that large forces of labor engaged in seasonal work can be cut off when the season is over or the work is complete, but the interest and carrying charges on plant investment continue. Therefore, expensive machines for special work, not adaptable to general utility, may not be economical. There is also the question of obsolescence. During the period of development when machines are continually being improved there is a hesitancy to tie up capital in extensive installations which are liable to become obsolete in a short time.

In the railroad field, many and in fact the majority of the operations formerly requiring large forces of common labor may now be handled by labor-saving machines. There are, however, a few very important operations requiring much hand labor which are not yet successfully handled by machine. Among the operations which may now be handled with success and economy partly or wholly by machine are: Ditching, weed cleaning, ballast cleaning, tie tamping, rail laying, rail greasing, track oiling, cribbing, mowing right-of-way, labor transportation (motor car), grading, handling of all kinds of material by steam or gas-operated cranes, concrete mixing and conveying, spray painting, and the various pneumatic operations of cleaning, drilling and cutting.

Tie renewal, which is one of the largest major operations in track maintenance, has not yet yielded to the general use of machines. There are machines designed to pull out and replace ties but I do not think it can be said that they are in general use. There is not to my knowledge, as yet, any machine which can be operated over a stretch of track, removing and replacing ties in maintenance. There is a field for such a machine and it may, in my opinion, be developed in the next five years.

Surfacing and lining is another operation which requires large expenditures for hand labor. While there are track liners, ballast tampers and at least one surfacing machine, all of these operations are not combined. We may conceive of a machine which would move over a piece of track badly out of line and surface, and leave behind it a piece of track, mechanically precise in line and surface. This machine is not out of the realm of possible development.

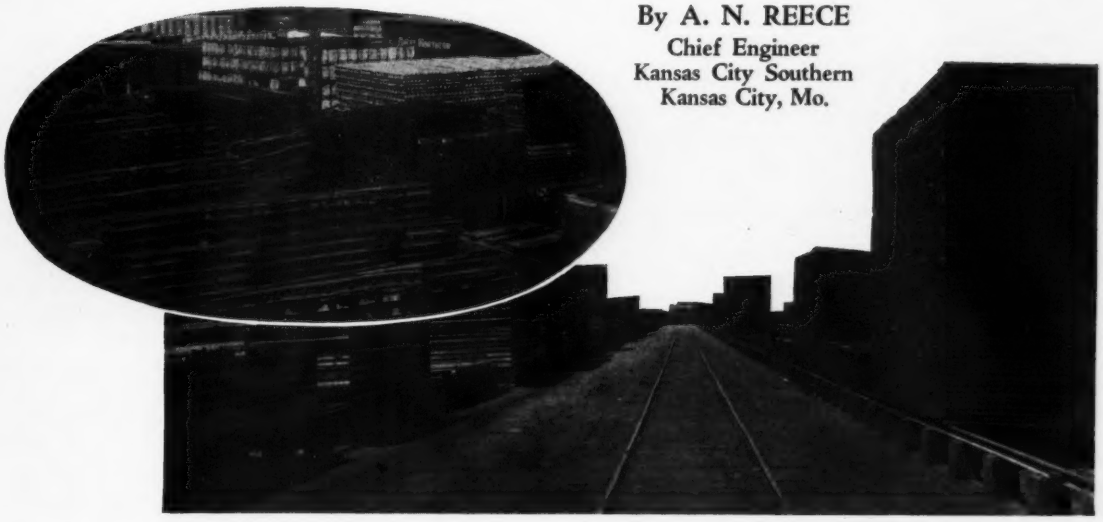
It is my opinion that the next five years will see a marked improvement in the design of existing machines along the line of efficiency and capacity and that there will be an increasing use of such machines. I believe there will be developments, at least into the experimental stage, of large machines for track maintenance operations which will combine a number of operations now performed by individual units. The use of such machines will be confined to multiple-track railroads where a track can be freed from traffic during its reconstruction. The smaller and more easily handled units will continue in use on single-track and dense-traffic lines.



On the Southern Pacific Near the Summit of the Sierra Nevada Mountains in California

Better Materials Also Result in a Saving of Labor

By A. N. REECE
Chief Engineer
Kansas City Southern
Kansas City, Mo.



THE high price of labor which has prevailed since about the end of the World War has created a problem for railroads, particularly in the maintenance and construction departments. Regardless of the cause of the high price of labor, it must be met, and study which has been given the problem leads the solution in two directions. Probably the most commonly discussed solution is the increase in the production of labor. As a direct result of this the introduction of labor-saving devices and equipment has been made to reduce the unit cost and increase the output with a smaller force. We must go back to the revolutionary period in the development of labor-saving devices to find the origin of the element of material in its relation to economy in labor. While a great deal has been accomplished in this work, untold research work and study still remain to be done, and if we are to approach the ideal, this subject should advance in parallel with the development of labor-saving equipment.

Is the Real Cost of Labor Greater?

Whether the real cost of railway maintenance labor, considered in connection with the cost of material, when based on today's averages, is greater than in the past may be seriously doubted. The price per unit or man-hour is certainly greater. But when compared to the cost of materials entering into railway maintenance, is the labor cost really proportionately higher? The truth probably is that railway maintenance labor is today more efficient—at least no less efficient—than at any time in railroad history. The demands made upon the track structure are so much greater, due to heavier power, longer and heavier trains, and higher speed than a quarter of a century ago, that a comparison with the maintenance methods and costs of those days is worth little.

The point, of course, is that while everything that enters into the operation and maintenance of a railroad has increased in price, railway earnings have not increased proportionately, and with the steadily mounting tax bill and operating costs proportionately higher, the margin between earnings and expenditures has become so small that advantage must be taken of every opportunity to cut these costs. This article is to deal with the development of better materials and the place of such materials in a program for the conservation of labor. The effect of a better quality of material on the labor cost is, of course, that less time or labor is required to maintain the better materials than those of poorer quality. Every item of material entering into the track structure has been studied with a view of improving its serviceableness.

Progress in Preservation

The first thought is the conservation of material for the purpose of increasing life. Timber used as ties and in bridges and to a certain extent in buildings has been treated by various methods to preserve it from decay. The treatment of timber in itself is a special study, and various methods have been found suitable to certain conditions which are not applicable universally. In other words, the service requirements, climatic conditions, etc., must be taken into consideration in determining the most beneficial type of treatment to use under the conditions. The treatment of timber has demonstrated its usefulness in lengthening life, and this has brought about measures for the protection of treated material against mechanical wear, particularly in crossties. The last available figures show that on railroads, as a whole, the treatment of ties, plus the means adopted for reducing wear, has decreased the annual requirements from 264 ties per mile in 1900 to 175 ties per mile in 1927. On roads having the means and where the cost

of timber is high, the longer and more general use of treated material has decreased the number of ties required per mile for maintenance to a figure much below the average. Further reduction can still be made through the study of protection of treated material against mechanical wear by means of various designs of tie plates. Obviously, much less labor is required to put in the lesser number of ties as compared with the numbers used in years preceding the periods of extremely high prices. This reduction has been made in the face of traffic of a greater density than was carried 25 or 30 years ago, with the effect that the real saving is undoubtedly much greater than the figures show. The use of treated timber in bridge structures has brought about a somewhat similar reduction in labor. The timber lasts longer, with the result that less labor is required to maintain the structures. The same applies to the use of treated material in fence posts, decking on platforms and in parts of building program work.

Better Design

The second most important item in the conservation of material to enhance life is in the redesign of plans, particularly in frog and switch work. Probably the most important development in this field is in the later types of crossing construction and in raising the wings of frogs to reduce wear. It is found, also, in the enlargement of parts to resist breakage, to give sufficient section to withstand wear, to prolong service life, and to distribute the compression loads not only on the materials themselves but on other units of the track structure.

The third element in the conservation of material has to do with the developments in metallurgy wherein the use of alloy steels, such as manganese, has been introduced for producing rail to resist abrasion, copper-bearing steel to prevent corrosion from exposure to elements, and a more careful limitation of chemical content has been effected. The development in the higher quality of materials through the application of chemistry and metallurgy also calls for organization for protective measures similar to the prevention of wear in treated crossties. In this field there have been developed methods for spraying rail and oiling angle bars and fastenings to prevent corrosion. It is almost needless to mention that the proper lubrication of switches and other movable parts is a necessity to the prolongation of life. The latest development in the element of protection of rail has to do with the restoration of end-batter by the use of electric or acetylene welding to restore the original section and give smooth riding joints.

The study of these various matters has led to the application of the same principles to the proper selection of ballast materials to meet subsidence conditions of railroads—materials most suitable from the standpoint of the labor cost of cleaning, replacement, growth of vegetation, etc.

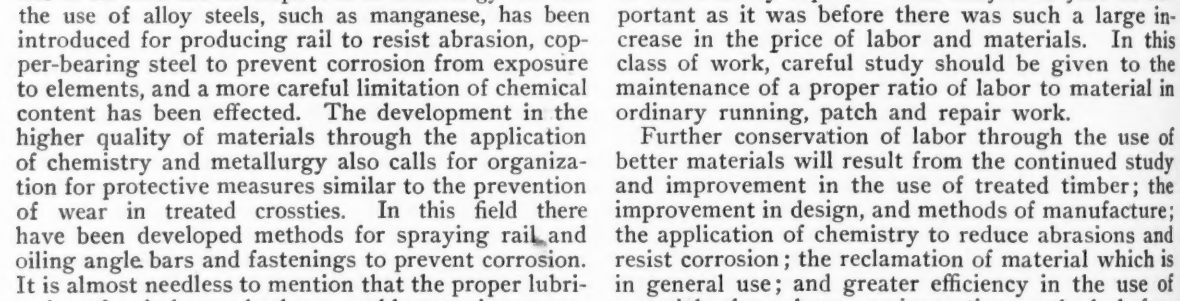
It has long been the practice to use concrete and steel in the replacement of temporary or short-lived structures, principally in bridge work. This principle, while of long standing and actual practice, is still important, but in view of the more modern development of the business, it can be said that this has grown to be the custom rather than the exception.

Greater attention has been paid in recent years to a more rigid classification of second-hand and scrap materials and reworking the usable material for reapplication. The use of such modern methods as electric and acetylene welding has made possible the reclamation of a great deal of frog and switch material which heretofore has been practically a total loss. Under the heading of reclamation should also be classified the modern practice of reforming angle bars, restoring them to their original section and crowning the middle section to take up the wear under the ball of the rail. The rerolling of rail into lighter sections for use on less important main lines is an item which should not be overlooked. Great economy has been effected on some roads by carrying out this practice, as well as that of sawing off ends of rails.

Patch Work or Heavy Repairs

There is a limit to which labor should be expended in doing patch work for rebuilding component parts of buildings, structures, etc., before the time has come to make heavy repairs. This subject is just as important as it was before there was such a large increase in the price of labor and materials. In this class of work, careful study should be given to the maintenance of a proper ratio of labor to material in ordinary running, patch and repair work.

Further conservation of labor through the use of better materials will result from the continued study and improvement in the use of treated timber; the improvement in design, and methods of manufacture; the application of chemistry to reduce abrasions and resist corrosion; the reclamation of material which is in general use; and greater efficiency in the use of materials through proper inspection methods before replacement. Behind all of this lies the simple economic principle—to determine the method of procedure, considering the service requirements from the standpoint of first cost and cost of maintenance, and to study the methods best adapted to the conditions at hand carefully before any method is adopted.



Rolling in a Double-Track, Through Girder Span 113 ft. Long on the St. Louis Southwestern near Paragould, Ark.

Are Your Section Gangs a Heritage of
Horse and Buggy Days?

An interview with William Shea, general roadmaster, Chicago, Milwaukee, St. Paul & Pacific, who describes a plan that will be tried out on that road

WHEN I was a young fellow out in Iowa, my father received notice one day from the township highway commissioner to appear on the road the next day with a shovel to work out his poll tax. It happened that father decided that he had something more important to do than to work on the road, so he said "Bill, I guess you'd better go over there tomorrow to work out that tax." So the next morning I was on hand with a shovel, and while I can't say much about the work we did or how much better the road was when we got through, I will say that we all had a nice visit.

Now, my reason for saying this is that it happens so often when I am riding trains on our road, or any other road for that matter, and pass a section gang, that I am reminded of that road gang I worked with back in Iowa many years ago. It does not mean that the average section foreman knows less about tracks than that road commissioner did about a highway, but nevertheless, the track gang, with its small force and a few hand tools, does remind me of the old-time road repair crew. The worst feature of the comparison is that highway work has made such a wonderful improvement. Out there in that same township they now have a young fellow with a power tractor and a grader, who does more in an hour than 25 poll-tax workers would do in a whole day with a few wornout shovels.

In our section work, we have made less progress in improving efficiency and in savng labor than we have in any other branch of railway service. In my opinion, section work, as it is now handled on American railroads, is ripe for a radical reorganization and I know that many other maintenance of way officers are of the same opinion, although they are not agreed by any means as to what should be done, or how extensive changes can be made. It may be that so far as minor branch lines with little traffic are concerned, there is not much that can be done. The small force that is required for policing on such lines is probably all that the railroads can afford to employ in productive maintenance. But on the important main lines, where the wear and tear of a heavy traffic has to be made good by large expenditures for maintenance, there is plenty of opportunity to institute reforms that will result in greater economy.

What is the matter with our section work? In the first place, the section gang has too many different kinds of work for a small gang to do on efficient production basis. The foreman has too many things on his mind. He has to divide his interest between his responsibility as an inspector and his job as a gang leader, and with the necessary limit on the amount of money that can be spent in the supervision of a gang of four or even six or eight men, there is a corresponding limit on the degree of executive ability that can be secured at the rate of pay which the average foreman receives. However, the big stumbling block in improving the efficiency of section work lies in the impracticability of replacing hand implements with power-driven tools.

I understand that this particular "Labor-Saving

Issue" is intended to concentrate attention on the need for keeping power equipment busy enough days in the year so that it can earn a return on the investment. That is where efforts to provide power tools for section work fall down. As I said before, the section gang has too many kinds of work to do—renewing ties, raising track, lining track, ditching, repairing fences, mowing right-of-way, repairing highway crossings, and a lot of other things. There isn't a chance, therefore, that any single piece of equipment, like a power tamper, for example, is going to be busy more than a very small part of the time, because it must be idle while all the other classes of work are being done.

Some roads have tried to get around this difficulty by assigning one machine to two adjoining sections, with the idea of having the two foremen trade it back and forth. Another scheme that has been tried to a small extent, is to lengthen the sections so that one foreman, with perhaps an assistant, is put in charge of a larger gang. This plan has some advantages, one of which is that it makes it possible to pay the foreman a better salary, but when this plan was proposed in a report before the Roadmasters' convention last fall, it met with a great many objections that are hard to overcome.

On the whole, it must be admitted that the most successful use of labor-saving machines in track maintenance work has been obtained in extra gangs where enough work of any one class is done each day to keep the equipment busy, and the men assigned to a machine or tool have a chance to become thoroughly trained in its operation.

I have thought a lot about this and have also talked about it. I know also that other track maintenance officers are not satisfied with the results they obtain from their expenditures for section-gang work. As a result, we have come to the conclusion that the nearer we can handle section work on the same basis that we do extra-gang work, the nearer we will come to getting the same results. As a consequence, we are planning to try an entirely new plan on a portion of our LaCrosse division, a high-speed, heavy-traffic, double-track main line.

A Specific Reorganization Will Be Tried

On this line where we now have sections averaging about four miles long, if our plans work out, we figure that we can reduce the number of sections about half by increasing the length of the sections to about eight miles. Each of these longer sections should be covered with a bare skeleton organization consisting of a foreman with say, two to four men. But the work of these small gangs will be confined almost altogether to policing, for the foreman's primary responsibility will be to see that the track is in safe condition for train movements. He will inspect the track for gage, surface, alinement, loose bolts, broken rails or angle bars, defective switches; in fact, he will insure against the presence of any dangerous condition. He will also be responsible for the condition of the right-of-way fences and gates, grade crossings, etc. In other words, the foreman and his gang will be responsible for and do all the work required of any section gang except what we might call the productive work demanded of section gangs during the working season.

By making the reduction in the number of men assigned to the sections, we will have available from the regular working force allotted to this division, at least 75 men, whom we will organize into a division maintenance gang. This gang should not be confused with an ordinary extra gang handling out-of-face work such as rail renewals or ballasting, because we are going to use this gang strictly for work that is usually done by the section forces. It will be employed in tie renewals, spot surfacing or raising joints, general bolt tightening, track lining, gaging, etc. Such work as ditching, shaping ballast section, burning or spraying weeds and mowing banks, will be done by modern machines that are in charge of and operated by highly skilled operators, either ahead or behind the maintenance gangs. These machines have such a capacity that they can do the necessary work on several divisions.

Such a gang must have high grade supervision and it will be placed in charge of a general foreman with two assistants. It will be provided with a high-grade camp outfit so that it can be moved over the division as the work progresses. However, the most important thing about this gang is that we expect to provide it with every kind of labor-saving equipment that can be used with good effect in the classes of work to be done. Of course, as I said before, ditching, ballast shaping, and weed burning or spraying will be done with modern machines, but that is not enough. We will have power tampers, power jacks, and power bolt tighteners, mowers, track liners, etc.

This gang will be organized with the idea of manning each unit of equipment for the season with men who will be trained in its use. The work is also being planned with a view to beginning at one end of the division and carrying it along progressively to the other end. Tie renewals will be followed by spot surfacing, and that in turn by the lining, gaging and dressing of the track within the limits of length of ties. Progress, of course, will depend upon the amount of work to be done, but in general, it should average about a mile of track a day in gravel ballast.

As this will be the first trial with this plan, it is expected that some adjustments may be necessary after the work is started. For example, conditions developing during the season may show that it is necessary to complete the work on some stretch of track in advance of the regular schedule. For the same reason, we may have to increase the force on certain of the sections when rough spots develop; as for example, after a period of heavy rainfall, in order to insure good riding track over the whole division throughout the year. However, I firmly believe that such questions will be ironed out after such a system of handling maintenance work has been in effect for several years. I am confident that it will result in so much better condition of the track for the same outlay, that less and less actual maintenance work will need to be done by the regular section forces. They will readily be able to do what little raising of joints is found necessary here and there, in addition to their policing work, to insure against any poor riding track.

In the case of our East La Crosse division, we feel that one gang will give us the most economical organization for work of the kind I have outlined. On a longer division or a line of different characteristics, it might be necessary to have two or even three gangs. On divisions with important intermediate terminals or intermediate towns with large mileages of industrial tracks, it would be necessary to make some increase in the skeleton section forces at those points.

New And Improved Devices

Fairmont Combined Motor Car and Paint-Spray Compressor

A MOTOR CAR equipped with an air compressor capable of supplying air for two paint-spray guns has been developed and placed on the market by Fairmont Railway Motors, Inc., Fairmont, Minn., which reduces the cost of the work and increases the mobility of railway painting forces on lines where train service is infrequent by eliminating the necessity of hauling a trailer carrying the compressor and an engine to operate it. The car is designated the Fairmont M22 paint-spray car.

The car is equipped with a two-cylinder, single-stage, air-cooled Curtis No. 80 Duplex Compressor

The M22 Paint-Spray Car With Seat Frame Removed to Give Access to the Parts

with a displacement of 19.9 cu. ft. of free air per min. with the engine governor set at 550 r. p. m. This capacity is ample to operate two guns, but if more air is desired the governor may be quickly changed, without tools, to 700 r. p. m., increasing the displacement to 25.35 cu. ft. of free air per min. A reservoir, 12 in. in diameter by 48 in. long, is provided to carry a reserve supply of air and to insure an even flow to the guns. This equipment is so placed that when it is covered by the seat frame, the car corresponds in appearance and capacity to the Fairmont M2 standard section car.

Power is furnished by a Fairmont Type-G, water-cooled engine, with Fairmont endless cord belts for driving both the car and the compressor. The change from one drive to the other is made by moving the engine along the sliding base to loosen the belt, which is then taken off the pulley and the other belt put on, after which the engine is shifted to tighten the belt. The engine is economical in the use of fuel, owing to the governor which cuts down the consumption of gasoline when no air is being used.

The car, with all equipment, weighs 1,540 lb. and is easily set off or on the track or moved around buildings when painting is being done. Rail skids are provided to facilitate sliding across high rails.

With this car, the radius of action of the painting gang from the siding where the outfit cars are located is materially increased, since the gang can work for several miles away from them and return quickly when the day's work is completed.

Power Jack for Surfacing Track

THE Nordberg Manufacturing Company, Milwaukee, Wis., has designed and placed on the market a power-operated jack which is designed for use in surfacing track in connection with ballasting work or where the track is being given a general raise. The device consists of two heavy screw jacks, so located on a steel car frame that the lower end of each screw, which terminates in a foot piece with a slotted connection, is located near the rail. Power is supplied by a 12-hp. twin-cylinder, air-cooled engine and the screws are actuated independently through twin disk clutches controlled by levers which permit both rails to be raised at the same time; one rail to be raised while the other remains stationary, or one rail to be raised and the other to be lowered simultaneously.

The machine is not self-propelling, but is pushed to the point where the raise is to be made, being

The Nordberg Power Jack

spotted to bring the foot pieces between the ties. The operator then steps on the platform, which sets the brakes, after which he applies the rail clamps by means of a lever at the rear right-hand corner of the car. When the jacks are run out so that the foot pieces are in contact with the ballast, their further movement raises the track. The machine is equipped with a level to aid the operator in maintaining the

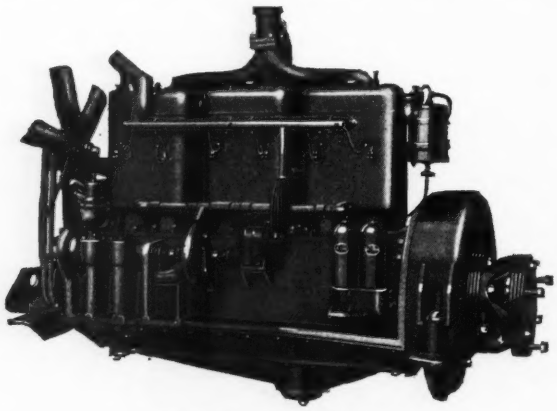
proper track level and also with a swinging target at the side for use in sighting between spot boards. It is said that the machine will raise track with sufficient rapidity to keep a gang of from 50 to 80 tampers busy.

The wheels are equipped with roller bearings to permit its being pushed easily and the wheels and clamps are insulated to avoid interference with track circuits for signals. The weight is such that it can be removed from the track by six or eight men. The machine is said to have a lifting capacity of from 25,000 to 30,000 pounds.

A Variable-Speed Motor for Crawler Equipment

A NEW feature embodied in the crawler equipment manufactured by the Northwest Engineering Company, Chicago, is an internal-combustion power plant which can be operated at any speed and controlled by an accelerator, permitting the engine to be operated at top speed in swinging or hoisting operations, similar to a steam engine, or to be slowed down when careful handling is necessary, as when laying pipe or placing a bucket accurately in clam-shell work. This feature is also of considerable advantage by making available a wide range of traveling speeds when the machine is moving.

Heretofore, variable-speed motors of the internal-combustion type have not been considered practicable for heavy-duty work in this class of equipment, owing to the difficulty in obtaining proper carburetion and distribution of the gas at the different speeds and varying loads. By the use of special manifolding and carbureting devices, which were developed in the Northwest company's experimental laboratories, this drawback has been overcome and the result is an engine which will deliver its full power for any speeds between 450 and 1200 r.p.m., with the ability to adapt itself to any sudden change of speed.



The New Power Plant

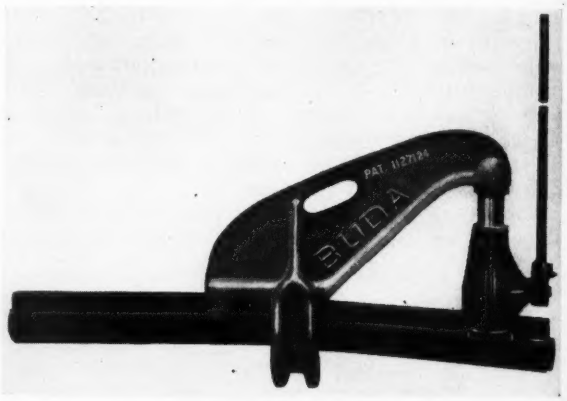
The motor is equipped with a governor which permits it to be operated as a fixed-speed engine when desired, but full manual control can be obtained by a lever which forms a hinged portion of one of the regular control levers, thus enabling the operator to vary the speed through a range from slow idling to the maximum without removing his hand from the regular control.

The new engine has been given thorough trials in the field, where it is said that repeated tests have shown it capable of performing from 15 to 20 per cent more work when operated as a variable-speed engine than when a fixed speed was used. In drag-line work, a machine used by Cannel & Conrad is reported to have shown an increase in production of 18 per cent by the use of the accelerator control.

The Buda Jack-Type Rail Bender

THE Buda Company has developed and is now placing on the market a jack-type rail bender with which one man can bend rails weighing up to 110 pounds per yard while two men can bend rails weighing from 110 pounds to 130 pounds per yard. The bender is made specially for T-rails and weighs 145 lb. complete.

The device consists of a steel frame, one end of which clamps over the head of the rail, while the other end engages the top of a 25-ton capacity journal jack. In operation, the base of the jack is placed on the side of the head of the rail with the clamp in position at the point where the bend is desired. The jack is then operated with a lever 38 inches long until the rail has been bent to the required angle.



The Buda Jack-Type Rail Bender

Electric Tampers Now Used in Gravel Ballast

THAT 171 miles of track on the Chicago, Milwaukee, St. Paul & Pacific were ballasted with gravel during the last year with electric tampers manufactured by the Electric Tamper and Equipment Company, Chicago, is an effective demonstration of the practicability of using these power tools in surfacing track with light ballast. The significant feature of this recent development is the fact that such work is being done with the improved Jackson universal electric tamper, a hand-held tool that can be employed interchangeably in either stone or the lighter ballasts by simply changing the blades, a matter of a few minutes' time. But of still more interest is the manner in which this development came about.

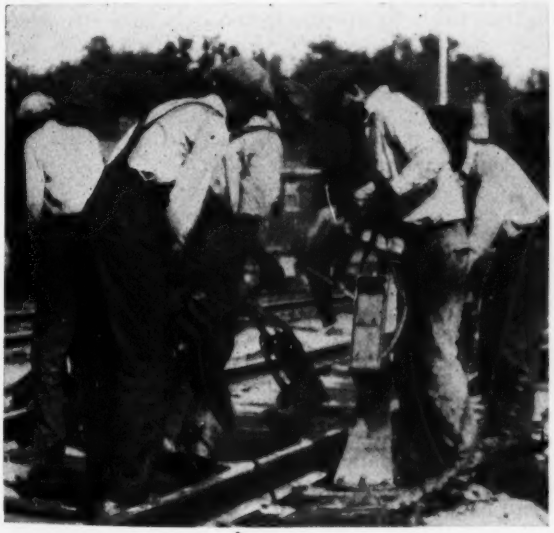
The first effective demonstration of the practicability of the power tamping of gravel ballast with equipment manufactured by this company was made with the introduction of the three-wheel gravel ballaster described in *Railway Engineering and Maintenance* for March, 1928, page 132. However, about the same time, experiments were made with the use of a wide blade on the hand-held tamper which had previously been employed almost entirely in rock ballast, and it was found that, while both types of equipment produced effective results, the hand-held

tamper proved to be faster and was favored on most railroads because of the greater convenience in clearing track for trains.

An illustration of the results obtained with it is afforded by a record of 2,552 ft. of track tamped per day as the average performance per four-tool outfit used on the Milwaukee during the season of 1928.

The Universal Tamper Showing Both the Rock and Gravel Ballast Blades with Renewable Tips

The essential feature of the gravel ballaster is the design of the blade, a tool-steel plate nine inches wide on the face. However, the action of the tool in tamping is not confined to the driving action of the face but to the effect of the vibration of the entire blade on all of the ballast in contact with it—that of accelerating the flow of the particles of gravel down to the driving edge or face.



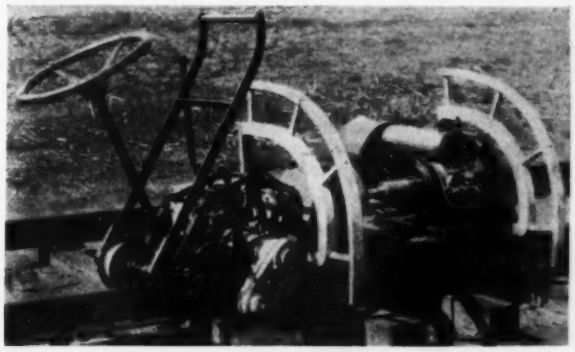
The Tampers Were Used Extensively in Gravel Ballast During the Last Year

Concurrent with the adaptation of the Jackson electric tamper for use in gravel and other light ballast, several improvements were made in the tool itself. Chief among these was the entire reconstruction of the handle. Instead of the double spring handle formerly provided, the machines are now equipped with a simple and direct tee-frame handle that affords the operator a much more effective control of the tool, not only in raising and lowering but also in controlling the direction of the blade. The necessary cushioning of the vibration produced by the old handle springs is afforded in the new handle by a piece of leather belting which serves as the means by which the motor housing is attached to the handle. A simple adjustment is provided to fix the amount of play permitted. An adapter has also been designed whereby old tools now in service may be equipped with the new style handles.

Another improvement effected is that of providing renewable tips for the tamper blades. These are small castings of manganese steel, designed to fit over the end of the blade and take the wear that occurs in the use of the tool. As these tips are held in place by two ⅜-in. soft steel rivets that are driven cold, they may be renewed in a few minutes' time in the field.

The Woolery Bolt Tightener

A MECHANICAL track-bolt tightener, operated by a gasoline engine, which can be adjusted to apply any desired force below its maximum capacity and which will cease to function when the predetermined force has been reached, has been developed and placed on the market by the Woolery Machine Co., Minneapolis, Minn. The engine and other mechanism are mounted on a steel frame provided with small double-flanged wheels on which it is pushed along the rail; two quadrant frames or rockers extend crosswise of the machine to enable it to be rolled off of the track quickly in cases of emergency.



The Woolery Bolt Tightener Ready for Service

A power wrench is mounted on each side of the rail so that the nuts can be tightened no matter on which side of the rail they are placed. The wrenches are driven through suitable gears by a shaft which is connected to the motor by a clutch mechanism which provides two speeds. The machine is said to have sufficient power to tighten the bolts to a point where hand wrenching is not required to bring the bolts to the desired tension, or to remove the nuts from old bolts, the bolts being twisted off if the nuts are so badly rusted that they cannot be turned.

In running up nuts on a rail-laying job, the machine is operated in high gear until the nuts are in contact with the nut locks or spring washers and is then shifted to low gear. The tightening continues until the desired maximum pressure has been reached, when the clutch is disengaged automatically

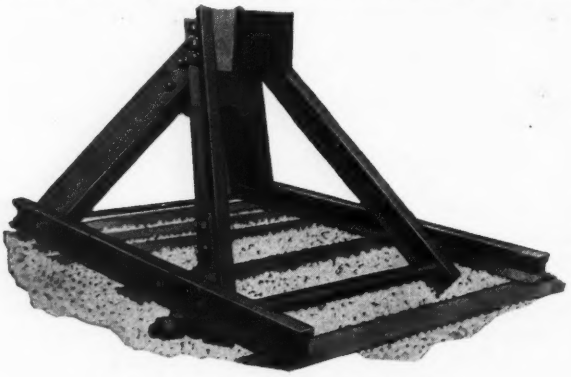
by a mechanism in which a calibrated spring is employed. To adjust the machine so that it will release at the desired pressure, a nut is tightened by a hand wrench, using the requisite maximum force, and the pressure-regulating device is then adjusted so that the clutch will disengage when the wrench will just give a turning motion to the nut.

The machine requires the services of only two men: an operator, who adjusts the wrenches on the nuts and looks after the mechanism, and a laborer who helps move the machine forward or remove it from and replace it on the track, as well as performing any other duties which may arise. The device is said to be capable of tightening the bolts in from 200 to 300 joints per day on existing track and in from 150 to 200 joints when laying new rail. Besides the saving in labor effected by the machine, the further advantage is claimed that the bolts are tightened to a uniform tension, which results in a better joint with less likelihood of the nuts becoming loose.

The Durable "Model B" All-Metal Bumping Post

THE Mechanical Manufacturing Company, Chicago, has modified the design of its Durable bumping post in order to effect a saving in the time and labor required for installation, as well as to provide greater strength to resist the strains imposed by the heavier cars now in service.

In the new post, which is designated the Durable Model B, the bent rails formerly used to connect the head of the post to the running rails have been replaced with straight rails which are attached to the bumper head in the same manner as in the former model, while their lower ends extend below the bottoms of the track rails, being attached to these rails by two bolts of the same diameter as the track bolts, which pass through electric-steel castings that



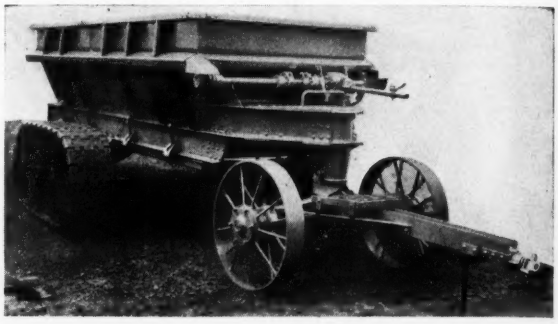
The Durable Model B Bumping Post

bear against the webs of the rails. The lower ends of the anchor rails are drilled to receive a heavy cross-bar which bears snugly against the bottoms of the running rails and which is provided with clips which engage the outer flanges of these rails, together with nuts for holding them in place securely.

This form of construction requires the drilling of only four bolt holes of ordinary size for the attachment of the anchor rails, thus permitting the work to be done with the regular track drill, as compared with 10 holes for oversized bolts in the old model. It also provides greater strength by tying the structure together firmly, and resisting the tendency of the track to spread, while the cross-bar utilizes the weight of the car to resist the tendency of the track to raise at the point of attachment of the anchor rails when the post is subjected to heavy impacts. The substitution of straight anchor rails for the bent rails formerly used also eliminates the possibility of these rails losing some of their holding power by the tendency of the bends to straighten under heavy shocks.

The Western Crawler Dump Wagon

THE USE of motor equipment in grading operations has not only displaced horse-drawn wagons on work involving long hauls but has also supplanted train haul in many cases where the location of the material or the desired method of carrying on the work would entail heavy expense for tracks and high costs for excavation.



A 10-yd. Western Crawler Dump Wagon

To effect further economies in wagon haul the Western Wheeled Scraper Company, Aurora, Ill., has developed an all-steel wagon of large capacity, equipped with a crawler tread which permits hauling full loads by tractor over sandy or wet ground. The wagons are available in capacities of 5, 7 and 10 cu. yd., and can be hauled singly or in trains of two or three, depending on the power of the tractor and the condition of the ground over which the hauling must be done. The 5-yd. wagons have two bottom doors and the 10-yd. wagons have two sets of doors, while the 7-yd. wagons have two sets of doors when built with front running gear and one set when designed for a direct hitch to the tractor. In the front running-gear wagons nearly 90 per cent of the load is carried by the crawler.

The 7-yd. wagons can be loaded by elevating graders or power shovels, while the 10-yd. wagons must be loaded with shovels or buckets, the sides being too high to permit the use of the grader. The large capacities of the wagons contribute to economy and efficiency in the use of the loading equipment by making a material reduction in the number of times the loading must be stopped when wagons of small capacity are used.

The efficiency of these wagons was illustrated recently in the building of an embankment on the Detroit, Toledo & Ironton by the Cook-O'Brien Construction Company, Kansas City, Mo. The embankment was 3,000 ft. long and contained 300,000 cu. yd., and the material was to be loaded with elevating graders from a borrow-pit about 1,100 ft. square. The shortest haul was about 1,750 ft. and the longest haul about 3,700 ft.

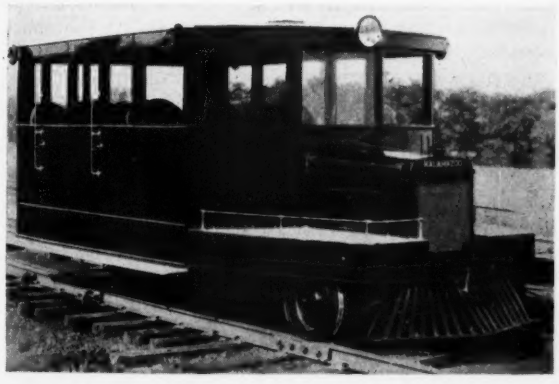
The construction company sublet 100,000 cu. yd. to a team outfit and undertook to complete the remain-

work was finished so far ahead of the specified time that an additional contract for 75,000 cu. yds. was taken and this was completed by December 1. On this job, two 10-hr. shifts were worked daily, the day shift working six days a week and the night shift seven days a week.

Western Seven-Yard Wagons on the D. T. & I.

New Kalamazoo No. 55-12 De Luxe Inspection Car

THE Kalamazoo Railway Supply Company, Kalamazoo, Mich., has introduced a new enclosed inspection car, which it has designated the No. 55-12 De Luxe, with a capacity for seating 12 persons comfortably. Power is supplied by a six-cylinder engine developing 55 hp., with a heavy-duty motor-coach transmission which, in connection with a Kalamazoo reverse transmission, provides three speeds in each direction. The final drive is through heavy roller chains to both the front and rear axles, thus providing a four-wheel drive. The car is equipped with a dual braking system, one set of brakes, with replaceable cast-iron shoes, operating on each of the four wheels, while a Lockheed hydraulic band-type brake is also provided. The trucks are mounted on elliptical springs and the 20-in. wheels are of the rubber-cushion type with forged steel tires to insure comfortable riding.



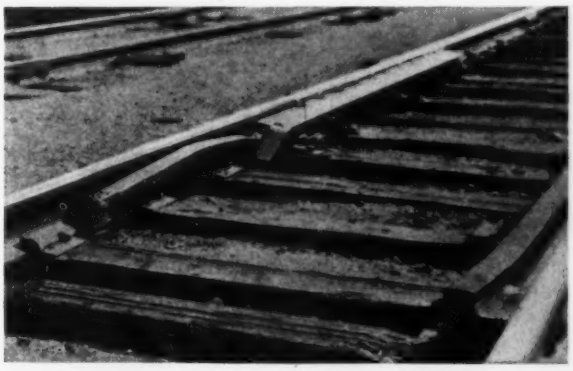
The Kalamazoo De Luxe Inspection Car

The construction of the body is the same as is used in motor coaches and the interior is finished in Spanish leather, with a floor covering of battleship linoleum. The seats are of the motor-coach type, made of wicker and upholstered with leather, with air cushions. The plate-glass windows are large and can be raised or lowered to any desired position. The car is equipped with an exhaust heater and also with a full electric equipment. The exterior of the car is finished in a two-tone high-grade enamel and all hardware and trimmings are nickel plated.

The use of this car provides for a good-sized inspection party at much less expense than when a train is used and since the body is fully enclosed the schedule may be adhered to with comfort when adverse weather conditions might otherwise halt or hamper the progress with cars of the open or semi-enclosed types. The three-speed transmission is also of benefit by making it possible to select the speed best suited to the work in hand.

The Improved Derrick Flange and Rail Oiler

TO ELIMINATE the use of "floating" or unspiked ties, the Maintenance Equipment Company, Chicago, has redesigned its Derrick flange and rail oiler to substitute a hinged ramp to actuate the shaft which rotates the oiling disks. Three partitions cross-wise have also been inserted in the oil trough to divide it into four compartments of equal length in order to prevent too great a variation in the distance between the top of the rail and the surface of the oil on heavy grades. The cover has also been extended to fit snugly against the lower part of the head of the rail to preclude more effectively the entrance of water into the oil, either in the form of rain or snow, or from the locomotive itself.



The Improved Derrick Oiler Is Actuated by a Ramp

View of Oiler with Cover Thrown Back

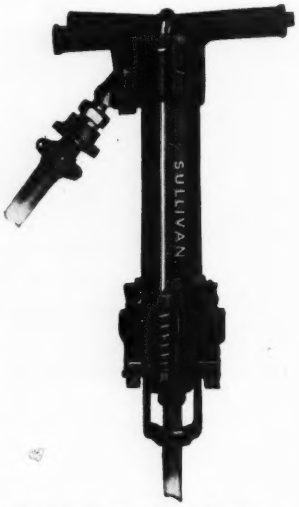
The ramp is placed on the inner side of the rail, the forward end being hinged to a casting which is clamped to the base of the rail. The end next to the trough is attached to a pawl and ratchet mechanism in such a way that when the ramp is depressed by

the flanges of the wheels of passing trains a rotary motion is imparted to the shaft which, in turn, rotates the oiling disks, the end of the ramp being held from exerting pressure at other times by a spring on its under side.

The Derrick oiler was described on page 191 of the May, 1927, issue of *Railway Engineering and Maintenance* in an article treating of the installation and performance of this device on the Norfolk & Western where its use has effected large savings in both labor and oil as compared with hand-oiling. The reduction in curve-wear on rails effected by oiling has also been found to lengthen the life of the rail materially.

The Sullivan "K-2" Concrete Breaker

THE increasing use of concrete for both paving and building construction has necessitated the development of tools for its demolition or removal quickly and cheaply. To make such a tool available, the Sullivan Machinery Company, Chicago, has developed and placed on the market what it has designated the Sullivan "K-2" Buster, which weighs 76 lbs. and which has a wide range of utility. Besides breaking up concrete pavements and walls, it may be used, with the proper tools, for excavating hardpan, shale or frozen ground, as well as for tamping back fill in trenches where the quantities involved do not warrant the purchase of special tamping tools. It may also be used for drilling shallow rock, obviating the purchase of a hammer drill where no heavy rock is involved.



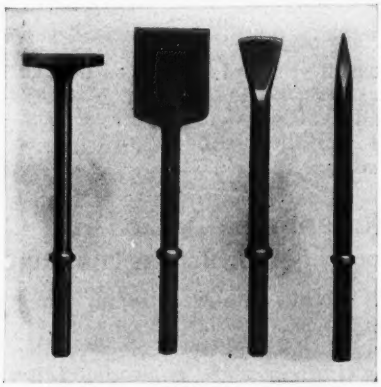
The Sullivan "K-2" Buster

The "K-2" has been designed to overcome the disadvantages of earlier types, both as to dependability in service and economy of operation. The cylinder is made from a solid bar of alloy steel, hardened by heat treatment and ground to size, the lower end of the cylinder being counter-bored to receive the buffer ring, thus maintaining the ring in true alinement with the cylinder and eliminating wedging of the piston. The piston, which is free-floating, is made of tool steel. The valve is of the hollow-shell cylindrical type, enclosed in a valve box and cover, which forms a separate unit housed in the handle of the tool, assuring protection from dust and rough handling. The action of the valve is positive on the forward stroke, insuring a hard blow, with a cushioning effect on the return stroke and making for economy of air and freedom from breakage.

The handle, which is machined from a solid drop-forged billet, contains the oil reservoir and the push-lever throttle, in addition to the valve assembly. The oil is carried by an automatic impulse oiler from the reservoir to an air pocket at the rear of the valve assembly and by this means is mixed thoroughly with the air as it flows to the valve and is distributed evenly to all the working parts. The push-lever throttle is so arranged that the piston will operate as long as the operator holds the tool against the work. When the pressure is released, the tool stops running, thus effecting economies in the consumption of air.

The chuck bushing, which receives the wear from the drill shank and which is easily replaced when worn, is enclosed in the chuck housing, which is machined from a drop-forged billet and heat treated. The drill-steel retainer is attached to the chuck housing, and is specially designed for concrete breaking service.

It is also provided with trunnions, by means of which it can be swung back out of the way when changing tools, and is also provided with heavy coiled springs to absorb shocks and vibration during operation. The parts of the machine are held together by a U-shaped side rod which passes completely around the tool and through lugs at the sides of the chuck housing, being secured by nuts. Coiled springs at the ends of the rod furnish an equalizing effect to keep the parts in alinement. To take the machine apart, it is necessary only to remove the two nuts at the ends of the side rod.



Tools Used With the "K-2" Buster

The Sullivan Company also makes a concrete breaker designated as the "K-4," which is similar in design and construction to the "K-2," but which is equipped with a striking block which transmits the blow of the piston to the shank of the tool. The "K-4" buster weighs 84 lbs.

Orton Introduces New Crane

THE Orton Crane & Shovel Company, Chicago, has just introduced what it has designated as its Model "MW" maintenance of way crane of the four-wheel gasoline-operated type, which embodies a number of distinctive features. One of these is the provision for eight traveling speeds ranging from 1½ to 20 miles per hour. Another is an arrangement of the all-steel, fully-enclosed cab in such a way that the operator's position is in a cab extension at one side of the hoist, rather than in the rear of it, so that he has an unobstructed view to the front and on both sides. The rear end radius of the cab, or tail swing, is only 6½ ft., so that the crane can be used on multiple track lines without fouling adjacent tracks.

Designed primarily to expedite the handling of rails and other materials in track-laying work, the new crane is also adapted for much of the work done by large locomotive cranes and for much of the material-handling work of the maintenance of way

and construction departments. It has a lifting capacity of 19,000 lb. at a 10-ft. radius. The crane boom can be equipped with a fall block and hook for ordinary lifting with sling or chain, or with an electro-magnet for handling iron and steel parts and scrap. Optional equipment includes a compressor for operating air-driven tools or a generator for operating electric-driven tools.

For track laying, the machine, which is full revolving, can be operated from its four-wheel car body, or from a flat car provided with rails spiked to standard gage. With the latter arrangement, the Model "MW" can be included in a supply train or used in work-train service.

Power for all operations is furnished by a 55-hp. gasoline engine of the heavy-duty type. The maximum drawbar pull is 9,000 lb., enabling the machine to move as many as eight cars at a time. Locomotion is simple, there being only one shaft in the car body, which is gear-driven from the engine and connected to the axles by an arrangement of sprockets and chains.

The car body is built up of structural-steel shapes and plates, which are riveted and electric-welded to form a unit structure possessing requisite strength and rigidity. The axles are carried on standard

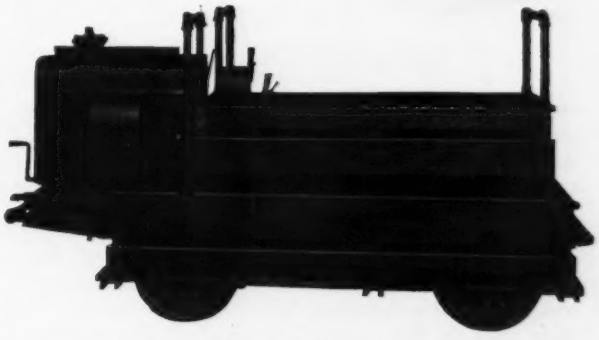
The New Orton Crane in Material Handling Service

spring-backed journals. Standard draft rigging and such appliances as a train line for air, hand grabs, etc., are provided.

Only four power shafts are required for the operating mechanism, and each shaft carries a clutch for controlling its particular function. No clutch is used for more than one operation, so that hoisting, swinging, traveling and radius-varying can be performed independently or at the same time. The power shafts are made of alloy steel, and each shaft can be removed without interfering with any of the others. Interchangeable phosphor-bronze bushings are provided for all bearings. The gears are made of special heat-treated alloy steel. The hoisting clutches are of the "V" type and are equipped with Orcoin blocks, a special type designed to withstand severe service. A V-type clutch is also provided to control the rapid swinging of the superstructure. The boom is of the four-angle, latticed, box-section type, and is electric-welded to provide strength and rigidity with minimum weight. The Model "MW" crane has an overall height of 10 ft. and can be transported completely assembled on a flat car.

Syntron Power Units for Electric Track Tools

MODIFICATIONS to permit the selection of power plants of varying capacities for operating electric track tools and also to adapt the motor-car plant for varying loads when it is used to haul heavy loads, have been made by the Syntron Company, Pittsburgh, Pa., in its line of power units which were described on pages 131 and 139 of the March, 1928,



Syntron Power-Unit Cars Are Now Available in Three Different Capacities

issue of *Railway Engineering and Maintenance*. The combined motor car and power unit is now available in 10, 15 and 25 kw. capacities and the car has been provided with a two-speed transmission for heavy hauling at low speeds. A portable power plant, similar to, but larger than, the unit for four and six-tamper outfits, has been designed for use with eight and 12-tamper outfits, while a smaller unit, weighing only 450 lb., has been developed for two tools only, to be used by small gangs under congested traffic conditions.

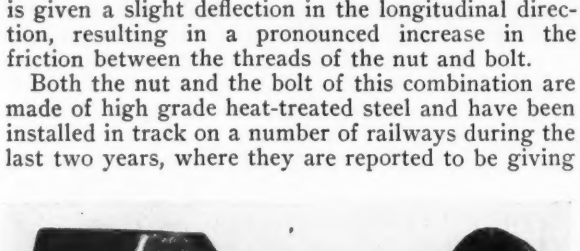
Selflock Nuts in Service Tests

EFFORTS to obtain satisfactory performance from rail joints and the fastenings in frogs and crossings have proceeded along two different directions. On the one hand, particularly in the case of rail joints, there has been considerable development in the use of various forms of springs between the nut and the member engaged, while on the other hand, equal attention has been given to the perfection of nut and bolt combinations that will insure against the nut turning on the bolt under the strains induced in service.

The most recent development along the latter line was effected by the Graham Nut & Bolt Company of Pittsburgh, Pa., which after extended experiments, has introduced "GCo" bolts equipped with "selflock" nuts. As described in detail in *Railway Engineering and Maintenance* for January, 1927, page 32, the "selflock" nut depends for its positive holding capacity on a unique form of thread. The pitch of the thread and its form inside of the pitch line con-

form exactly to United States standard threads, while that portion of the thread outside the pitch line is given a slight deflection in the longitudinal direction, resulting in a pronounced increase in the friction between the threads of the nut and bolt.

Both the nut and the bolt of this combination are made of high grade heat-treated steel and have been installed in track on a number of railways during the last two years, where they are reported to be giving



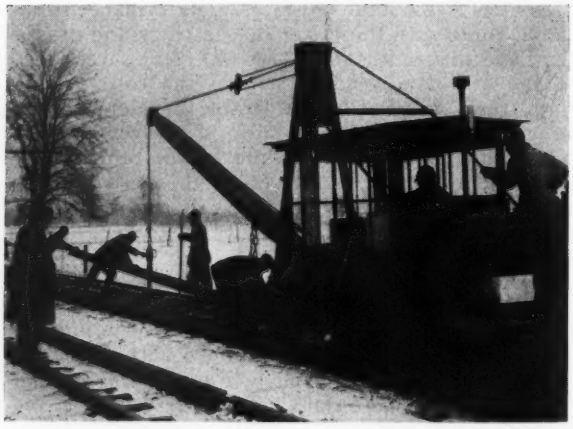
A Selflock Nut and Bolt

excellent service. In some cases nuts are reported to have not required tightening for as long as 12 to 14 months. One feature of added merit, to which no attention had been given at the time this form of nut was introduced, is that the particular form of thread not only effects a marked increase in the friction between the threads of the nut and bolt, but has been found in service to act as an effective seal against the elements. As a result, it is said that these nuts do not "freeze" to the bolts by reason of corrosion.

The Pittsburgh Screw & Bolt Company of Pittsburgh, Pa., has purchased the assets and property of the Graham company and will continue to produce and sell "GCo" bolts equipped with "GCo" selflock unit nuts.

K. & W. Electric Rail Crane Equipped for Work in Winter

THE K. & W. gas-electric rail crane, manufactured by the K. & W. Equipment Company, Chicago, has been equipped for winter work by enclosing the sides and rear of the car with glass and by omitting the diaphragm between the hood of the engine and the working deck, thus providing protection for the operator who, from the nature of his work, is precluded from taking the necessary exercise to keep warm.



The K. & W. Gas-Electric Rail Crane Equipped for Winter Work

One of these cranes, so fitted, was used by the Hocking Valley during the present winter in laying 130-lb. rail on its line north of Columbus, Ohio, the use of a crane for handling rail being particularly adapted for winter rail laying, since the hazards incurred by handling rails with tong men are increased materially when the ground is covered with snow and ice, while the flexibility of control afforded by electric operation is said to add further to the safety of the work.

On this job, Ingersoll-Rand pneumatically-operated bolters and spikers were used so that the new rail was completely spiked and bolted at the end of each day's work. In spite of continued cold weather, when the temperature often fell below zero, the work progressed satisfactorily, the largest day's work totaling 11,973 ft. of rail laid under heavy traffic with a gang of 70 men. The work was done under the general direction of W. L. Roller, engineer maintenance of way, Columbus, Ohio, and under the more direct supervision of F. A. Sparks, supervisor, Marion, Ohio.

The Fairmont M23 Big Discer

FAIRMONT Railway Motors, Inc., Fairmont, Minn., has developed a machine for discing ballast which it has designated the Fairmont M23 Big Discer and embodies a number of improvements over earlier models of Fairmont discers, both as to capac-

Each Discing Arm is Controlled by an Operator

ity and other operating features. The machine requires the service of only three men; an operator, an assistant and a pilot to handle the train orders under which the discer is operated on main tracks. Two of these machines are each said to have made 40 miles a day on numerous occasions, cutting 8 in. deep to a width of 4½ ft. on each end of the ties, the outer 6 to 18 in. being in old sod, at a cost of 52 cents a mile.

The discing speed is from six to eight miles per hour, and discing may be done on both sides at the same time or on either side only as desired. Each discing arm carries eight discs which are mounted on Timken tapered roller bearings to insure maximum resistance to thrust and wear, and each disc can be adjusted for pitch, depth and angle to conform to any roadbed or ballast section. Any of the discs are removable, permitting the use of the mach-

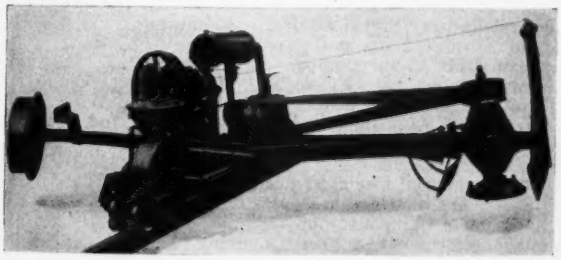
ine for establishing sod lines or cutting weeds without expending power to disc ballast which may not require it. The inner disc on each side is mounted on a spring so that the disc will swing up without damage on striking the end of a tie and return to the proper position after the obstruction has been passed. By reversing the discs the old ballast can be thrown away from the ends of the ties rapidly and cheaply when the ballast is to be cleaned or new ballast is to be applied.

The discing arms are raised to pass whistle posts or other obstructions by means of an air hoist on each side operated by a valve. This permits the arms to be raised on either side without reducing the working speed and eliminates delays. In heavy cutting, where additional weight is needed to insure penetration, this is provided by 85-lb. weights which are placed above the discs, thus eliminating the hazard incurred by the practice of having men ride on the discing arms for this purpose.

The machine complete weighs 10,000 lb. and is driven by a six-cylinder Continental industrial-type engine developing 74 hp. at 2,500 r. p. m. An extra large radiator with a gear-driven pump and a self-adjusting, ball-bearing fan is provided to keep the engine from overheating in heavy work. A standard Brown-Lipe heavy-duty truck transmission is used and a Fairmont reverse gear on the rear axles provides five speeds in either direction, this feature, with the high working and traveling speeds insuring a maximum time for work on the line by reducing the delays occasioned by clearing for traffic.

Machine Adzes Ties in Track

THE mechanical adzing of ties in track is accomplished by a device developed and placed on the market by the Nordberg Manufacturing Company, Milwaukee, Wis., which is said to do as much work as 20 men can do with hand adzes, thus saving time and labor as well as eliminating the hazard of personal injury which is inherent in this kind of work.



The Nordberg Adzer

The machine consists of a cutter-head, belt-driven by a 12-hp. twin-cylinder gasoline engine, mounted on a triangular steel frame which is carried on the track by three wheels when taking the machine to or from the work. In operation, the third wheel is swung back as a counter weight to hold the cutter-head above the ties, and the machine stands on one rail, being held in position by ball-bearing rollers on both sides of the head of the rail.

The cutter-head is fitted with seven cutting tools made of high-speed tool steel, ½-in. square, which are arranged in spiral form and clamped in place. The underside of the cutter head carries a gage plate which can be adjusted to the depth to which the adzing is desired and which acts as a stop when the tie has been adzed to that depth. In operation, the gage plate is brought down to the rail seat in the tie, made by the old rail, thus insuring that the adzing will be done to the proper depth. If desired, the cutter-head can be arranged to provide a cant for the rail.

The Kalamazoo "216" Light Inspection Car

THE Kalamazoo Railway Supply Company, Kalamazoo, Mich., has developed a light center-load inspection car which can be handled easily by one man, yet which is strong enough and roomy enough to accommodate four men comfortably, giving it a wide range of service. The car is equipped with the same engine, axles and bearings as used in the Kalamazoo "216L" one-man inspection car which was described on page 549 of the December, 1926, issue of *Railway Engineering and Maintenance*. This feature is of great convenience and reduces the stocks of repair parts where both types of car are used on the same road.

The Kalamazoo "216" Light Inspection Car Will Carry Four Men but Can Be Handled by One

The engine is reversible and is water-cooled, a small radiator on the cylinder condensing the steam so that little water is consumed. The weight of the car is 480 lb. and it has a range of speed of from 5 to 30 miles in each direction.

Twin Tunnels on the Union Pacific

N. R. A. A. Exhibitors

Display of maintenance devices at the Coliseum is of great interest during "Engineering Week" in Chicago

FOR THE twenty-first time, the National Railway Appliances Association has completed plans for the annual exhibition to be held at the Coliseum in Chicago on March 4 to 7, inclusive. This exhibit of devices and materials used in tracks and other fixed properties of the railroads or in their maintenance and construction, has become an established feature of "Engineering Week" in Chicago, that, to many men, is of equal importance with the convention of American Railway Engineering Association and the meeting of the Signal Section of the A. R. A., which take place concurrently.

As in past years, all space available for exhibit purposes was taken up by the various participating firms long in advance of the opening date, and many applicants for exhibit booths have had to be turned away. Preference is given to manufacturers who have been exhibitors in previous years and most of these select the same space each year, knowing that regular visitors have become accustomed to look for their displays in given locations. However, for the benefit of those who are not so familiar with the exhibit, and to present a complete record of it, we give below a complete list of the firms participating, the booth numbers following each name providing the key to the location on the accompanying floor plan.

The exhibit will open on Monday morning, March 4, and will close on Thursday afternoon. It will close each day at 6 p. m. except on Tuesday when it will be open until 10 p. m.

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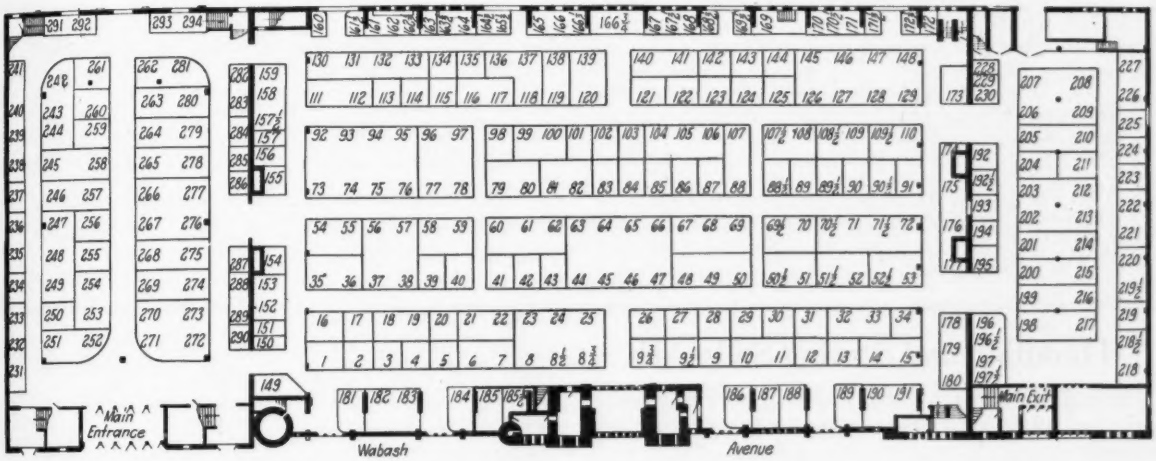

Floor Plan of the Exhibit Space at the Coliseum, Chicago

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Bridge Over Quail Spring Wash, Southern Pacific

WHAT'S THE ANSWER?

Have you a question you would like to have someone answer?

Have you an answer to any of the questions listed below?

QUESTIONS TO BE ANSWERED IN THE MAY ISSUE

1. *Under what conditions should track laborers be required to wear goggles?*

2. *What special precautions should be taken when driving piles by means of leads hung from the boom of a crane?*

3. *When track is raised out of face at regular intervals, what should be the procedure as regards tie renewals, additional ballast and other related items?*

4. *What are the relative merits of the different types of floors for large freight stations where heavy trucking is done?*

5. *How can old water mains or similar underground pipes be located when no record of their location is available?*

6. *What is the best method of storing gasoline at section headquarters for motor cars and other motorized equipment?*

7. *What factors govern the amount of materials to be carried for emergency bridge work? Is it desirable to carry good second-hand materials in such stocks?*

8. *To what extent is it practicable to straighten surface bent rail? How can this be done?*

Handling and Storing Soda-Ash

What is the best method of handling and storing soda-ash for water stations to avoid undue expense and waste?

Proper Facilities Should Be Provided

By J. H. DAVIDSON
Water Engineer, Missouri-Kansas-Texas, Parsons, Kan.

Soda-ash for water softening is usually shipped in burlap bags containing 150 pounds each, and may be stored in these bags with practically no deterioration in a dry room. The storage room should be separate from the machinery room of water-treating plants and there is less danger of the soda-ash forming into hard lumps in the bottom bags if, instead of stacking them directly on the floor, a slightly elevated slatted platform is provided. A bin into which several sacks can be emptied and from which the soda-ash can be taken for use will often prevent waste.

If possible, the water softening plant should be located so that an unloading platform and runway can be provided adjacent to a track so that the soda-ash can be unloaded from the car and stacked in the house by the use of hand trucks, with a minimum of labor and liability of waste. The bags should never be dragged over the floor of the car nor on the ground, as such handling results in torn sacks and loss of material.

If possible, the soda-ash should be so arranged in the storage room that any of the old supply on hand when a new shipment is received will be accessible for use before the fresh supply. Water-treating plant operators should not cut or tear the bags but should open them by cutting the string with which they are sewed as the bags have a resale value of five or six cents each if kept in good condition.

Where a supply train is operated by the stores department at intervals of 90 days, or less, it will be found advantageous to distribute the soda-ash to the smaller wayside plants by this service rather than by a peddler car. These wayside water stations are frequently located between stations, where no siding is provided and where unloading docks are impracticable. At such points, the supply train can stop while the section men or other employees unload the soda-ash and store it in the treating plant.

At the larger stations where a car load of soda-ash is used in a short time, it is of course economical to handle it in car-load lots and at such places unloading docks and runways to facilitate trucking should be provided. If it is necessary to locate a large plant so that it cannot be served by an unloading track and the distance from the unloading point is too great for the economical use of hand trucks, a light track over which push cars can be operated, will be found advantageous.

Many Precautions Must Be Taken

By ENGINEER WATER SERVICE

While this question refers specifically to soda-ash, the handling of lime is so closely inter-related with it that the same precautions should be taken in the handling and storage of both of these materials.

One of the most important features is to protect them from moisture, either in the form of rain or from other sources. For this reason, they should be stored in bins or rooms which will not permit the entrance of rain and which are provided with floors to keep the lime or soda-ash from contact with the

ground. The floor should preferably be raised from the ground and if it is of concrete, boards should be placed on it on which to pile the bags or barrels.

The storage space should be arranged so that the materials can be taken for use in the same order in which they are received, to insure that the older portions will be used first. They should be furnished in bags or barrels of such size as can be handled conveniently by one man, since if they are supplied in bags weighing 200 or 300 pounds the tendency is to cut the bags in order to take out small quantities and this leads to deterioration by exposure to air. Repeated handling of bags or barrels should be avoided.

Care must be taken in unloading from cars, both to avoid breaking the package and to keep them from contact with the ground. When the materials are unloaded from a siding the cost of an elevated platform will soon be repaid by the savings effected, both in labor and loss of materials. Where the materials must be unloaded from the main track between stations, a platform should be provided at the track level.

Churning Joints

Does the use of hardwood ties at the joints and softwood ties under the rest of the rail accelerate the pumping of joints?

Hardwood Ties Will Decrease Pumping

By J. J. Desmond
Roadmaster, Illinois Central, Chicago

The use of hardwood ties at the rail joint tends to stabilize the joint to the extent that it will avoid the mechanical wear which occurs when softwood ties are used as joint ties. The pumping of joints is caused by the unusual hammer or pound, due to the break in the surface of the rail and to the mechanical wear in the tie. If the mechanical wear in the tie is increased, the amount of pumping at the joint will increase and my experience has been that hardwood ties at the joints can be used to good advantage provided such ties are available and can be distributed at not too great a cost, as it is considered good practice to use the largest and best ties as joint and shoulder ties.

This Practice Causes Joints to Churn

By Division Engineer, Canadian Road

We receive annually a number of hardwood ties among our treated semi-hardwood ones, and in the ordinary renewal program they are inserted in track as they are unloaded from the cars, without particular regard to the class of wood. In this way, the hardwood ties are sprinkled all through the rail, but are often found under the joints, where they seem to cause the ballast to churn or puddle. This condition is not alone confined to locations where the rail ends are somewhat battered or a clean ballast cushion perhaps a little scant, but is also encountered on portions of track where both rail and ballast may be considered good as to average conditions.

When we first began to get treated ties, the hardwood ties were selected for the joints from a natural desire of the roadmaster to strengthen the track at these points, but on some parts of our fast main track divisions, it was found difficult to maintain the joints in proper condition owing to "puddling" taking place, and this, of course, affected the riding qualities of the track. For that reason the practice of selecting hardwood ties for use under joints was discontinued.

The softwood ties do not act in this maner and this is no doubt due to their greater resiliency under the impact of heavy loads. This puddling will perhaps cease gradually as the softwood ties are replaced with harder ties, by providing a more uniformly resilient cushion under the rails.

Lining Turnout Curves

What are the relative merits of the methods of lining turnout curves by offsets from the main track rail and by ordinates from the chord of the curve? What precautions are necessary in the use of either of these methods to insure accurate results?

Offsets Will Give Good Line

By H. R. Clarke
General Inspector Permanent Way, Chicago, Burlington & Quincy, Chicago

Our standard turnout plans show the offset distances between the gage lines of the main rail and the outer rail of the lead at regular intervals from the heel of the switch and we find that their use enables the lead to be put in good line quickly. All foremen or section and extra gangs are furnished with blue prints of these plans and we find that when the offsets as shown are used, the lead can be lined much more rapidly and accurately than when the work is done "by eye." The principal precaution necessary is to see that the offsets are measured at right angles to the main rail.

Either Method Will Give Good Results

By V. H. Shore
Yard Foreman, Atchison, Topeka & Santa Fe, Dodge City, Kan.

The results obtained from either of these methods are the same, providing care is taken in the measurements and the main track from which the turnout leads is in first-class line before the measurements are taken. Measurements should be taken from the gage side of the main track rail to the gage side of the turnout rail when offsets from the main track rail are used and the rail spiked at the offsets accordingly. Ordinarily, two or more offset measurements are given between the heel of the switch point and the toe of the frog on the curve lead, which vary with different numbers of turnouts. For example, the beginning of the turnout curve at the heel of the switch point is governed by the cast iron switch heel block and the offset at this location is usually 5½ in., the location at the toe of the frog being governed by the frog being spiked to proper gage. The above two locations or offsets are the same in all cases for any particular number of turnout. The two intermediate offsets of a No. 10 turnout, measuring from gage to gage from the main rail to outside rail of turnout, are 14½ in. at a point 18 ft. 11⅞ in. back of the heel of the switch point and 28½ in. at a point 18 ft. 11½ in. farther back. The remainder of the curve can be lined easily by the eye.

A practical and more simple method is lining the turnout curve with a string, using 3 ordinates. The string is held against the gage line at the heel of the switch, and the toe of the frog, the heel of the switch being spiked with the proper heel spread and the main track rail correctly lined. The middle ordinate

used is 6 in. and the ordinates at the quarters are 4½ in. or three-fourths of the middle ordinate for any number of turnout from tangent track. When this method is used on turnouts from curved track the middle ordinate is increased or diminished by ascertaining the middle ordinate of the main-track rail by using the same length of string and measuring directly opposite the lead curve. If the turnout is from the inside of a curve, the middle ordinate obtained from the main curve would be added and if from the outside of the main curve it would be subtracted, taking three-fourths of the result as the quarter ordinates. For example, if the middle ordinate of the main-track rail is 2 in., the middle ordinate for lining the lead curve for a turnout from the inside of a curve would be 6 in. plus 2 in., or 8 in., and the quarter ordinates would be three-fourths of 8 in., or 6 in. If from the outside of the main curve the middle ordinate would become 4 in. and the quarter ordinates 3 in.

The writer has used both methods with equally good results but for laying new yard turnouts or relining other yard turnouts, he prefers the latter, since it can be used for any turnout and is more simple.

Offsets for the different numbers of turnouts can be obtained from the engineering department and are given in the rules and regulations for the maintenance of way by most first class railroads. They are accurate and should be used on all main line switches.

Air-Driven Tools on Bridge Work

When an air compressor is installed for riveting on bridge erection, what other air-driven tools can be used to advantage?

Various Tools May Be Used With Economy

By R. W. Johnson
Assistant Engineer, Chicago, Milwaukee, St. Paul & Pacific, Chicago

A great deal of our steel bridge work consists of repairing and altering old spans, many of them under traffic. In such cases, while riveting, we also run drills and reamers. While using drills, we have a small air-driven emery wheel mounted on the compressor car and the drills are sharpened by the man in charge of the compressor.

On new work, we do not anchor our end bearings, except in a few special instances, until all the steel is erected. Then, while the riveting gangs are at work, the compressor operator drills the anchor bolt holes at spare intervals. As our compressors are small, the rock drill would draw too heavily on the air supply if operated simultaneously with the riveting hammers; consequently, the operator watches his opportunity and drills while one or more of the hammers are not working. In this way, our anchor-bolt holes are drilled and the anchor bolts are placed very cheaply.

In repairing roof trusses in one of the old-style train sheds, we used an air hoist mounted on the compressor to raise purlins and other material, and have used the same method to hoist stringers in repairing an overhead highway bridge.

We find the air tanks furnished by the manufacturer to be too small in capacity to give much of an air reserve, so we install an auxiliary tank about 3 feet in diameter and 5 feet long near the compressor, or sometimes in the pipe line, if we are piping air some distance. This tank will furnish enough pressure to drive two or three rivets after the compressor has shut down. This insures completing the driving of the rivets the men are working on if the compressor should stop accidentally. Our compressors range in size from 5 in. by 5 in. to 7 inches by 6 in. and are mounted on trucks with flanged wheels for standard-gage track.

Many Tools Will Be Found Advantageous

By W. H. Armstrong
Manager Tie Tamper Sales, Ingersoll-Rand Company, New York

In addition to the riveting hammer, such tools as drills, reamers, wire brushes, scaling tools, chipping hammers, paint sprays, sand blasts, cement guns, utility hoists, pumps, bolt tighteners and demolition tools may be used to advantage in connection with the compressor.

This equipment, together with economies effected by their use, is quite completely covered by a committee report presented at the annual convention of the American Railway Bridge and Building Association at Richmond, Va., October 12-15, 1926, an abstract of which was printed on page 470 of the November, 1926, issue of *Railway Engineering and Maintenance.*

Foundations for Frame Stations

What are the relative merits of creosoted pile heads and concrete pedestals for foundations for small frame stations?

Pile Heads Have Advantage of Low Cost

By L. H. Harper
Superintendent Creosote Plant, Central of Georgia, Macon, Georgia

The advantages in favor of creosoted pile heads are low cost and ease of application. From the standpoint of looks, permanency and freedom from fire hazard, concrete pedestals have the advantage. Good concrete is, of course, more permanent than timber and is practically fireproof when used in foundation work.

It is not always convenient to transport small lots of concrete material to a job; the making of concrete requires some skill, and the unit cost runs high on account of the nature of the work and the relatively small quantities involved.

On the other hand, wherever creosoted piles are used in trestle work there is an accumulation of cut-offs which can be made into foundation posts with little work. If these posts are mopped with hot creosote wherever the untreated wood has been exposed, they will last a great many years, and the fire hazard, while naturally greater than in the case of concrete, is not necessarily greater than in any other type of timber construction.

Concrete Is Preferred for Stations

By A. L. Sparks
Architect, Missouri-Kansas-Texas, St. Louis, Mo.

Concrete piers, 12 in. square, with concrete footings 2 ft. square and 12 in. thick, provide a stable foundation for small stations and other buildings. They are permanent, resist decay, mice, rats and other vermin, and are not easily twisted or turned.

Much annoyance has been experienced in some

locations on account of the destructive operations of termites in wooden sills, floors and foundations. This trouble can be largely avoided by the use of concrete piers coated with asphalt. The life of a heavy frame structure on an unstable foundation is shortened by sagging and warping, which causes the framing to open up, split and decay prematurely.

For light structures, buildings of a temporary nature, or buildings which may be moved, creosoted pile heads provide economical foundations. Such foundations can be installed quickly and built upon immediately without waiting for concrete to set.

Pile heads are sometimes desirable where concrete materials and water are not readily available and they can often be supplied without the delay of waiting on the approval of a requisition. For small buildings, they may be delivered with the lumber and all work completed at once with considerable saving in time.

Surplus pile heads so used may be salvaged where they might otherwise be wasted as scrap. They are sometimes provided with plank footings of creosoted 2-in. by 12-in. timbers and sometimes set on concrete footings. The latter makes a very satisfactory foundation for high wooden platforms.

Grades for Drain Tiles in Cuts

What is the practical minimum rate of grade for drain tiles in cuts? To what extent does this depend on the uniformity of the grade?

Grade Is Not as Important as Other Features of Installation

By J. W. Hunter
Track Drainage Engineer, W. S. Dickey Clay Manufacturing Company, Kansas City, Mo.

There is a great difference of opinion among engineers on this subject, some maintaining that 0.2 per cent is sufficient, while others maintain that the grade should be at least 0.6 per cent. Those making claims for each grade are practical, experienced men, although in some cases their experience has been with surface drainage. For example, one prominent engineer of a large railroad insists that the grade line of a drainage pipe line be 0.6 per cent, while he makes the grade in the bottom of his surface ditches 0.3 of one per cent.

The object of track drainage is to get the water from under the track, where it is harmful, to some point on the right of way where it can no longer be a menace to good roadbed. My experience teaches me that when the water is in the main drainage line after being conducted by pipe in the laterals from the water pocket under the track, it is no longer a menace and as long as the grade in the main line is great enough to cause the water to flow, even if it barely moves, the maintenance man's troubles are over as far as the water is concerned.

Conditions govern this matter to a large extent. In a flat country, I would have all the grade I could get, but the lateral lines would get most of this and as long as the water was moving in the main drainage line, which should be at least 10 feet from the rail, I would not worry whether I had a mill race in the main lines or just a smoothly running stream of water from a point where it was not wanted to some spot where it could be discharged without damage to the roadbed or track. I would break the grade line on the main lines where I could save some money on excess excavation and still keep the main line pipe at least two feet, and the lateral lines at least 18 in. below the bottoms of the water pockets. In referring to "drain tile" in this connection, it should be understood that bell-end sewer pipe is meant.

Much, indeed most, of the troubles experienced with track drainage has been occasioned by the use of unglazed farm tile, which is not strong enough to withstand the loads imposed by the traffic. These loads also tend to displace the pipe and to open the joints, not only allowing the water to enter the roadbed but also permitting the entrance of sediment to the pipes and clogging them so that they cease to function as drains.

Practical railroad drainage of water pockets is essentially an engineering job, from the time the first dirt is thrown in digging the test pits to determine the depth of water below the rail, to the time the pipe is covered and the trench is backfilled with the material. The engineer should take all the factors in the case into consideration, such as soil conditions (some soils requiring more frequent penetration with lateral lines to the water pocket), the various depths of the test pits, so as to raise the grade of the lines to avoid excessive excavation and costs, and the proper place for the outlet, so as to prevent future inconvenience or avoid affecting the sides of a fill.

Proper drainage is a money-saving improvement and too much care cannot be taken to get a nearly perfect drainage installation at the least possible cost. It has become a far different matter than when a certain amount of pipe was shipped to some roadmaster or supervisor and he was instructed to get it into a ditch in some cut or fill, which he promptly did because he did not want some one to see it on the right of way. Now the management wants to know just how much of the maintenance money has been saved by the drainage of the wet cut at a certain location, and if none was saved, why not?

Most engineers overlook the fact that the weight of heavy equipment is causing the ballast depth to increase as long as there is water in the roadbed and this is the reason for placing the pipe at least two feet deeper than the bottom of the water pocket in the main drainage lines and 18 in. in the laterals, to allow for an increase in depth of the water pocket, while the track is becoming thoroughly dried out.

Grade Should Be Uniform if Possible

By Roadmaster

In laying drain tiles in cuts, the grade should be made uniform if possible, although in general, in long cuts, it must conform more or less to the grade of the track. There is no objection to introducing heavier rates of grade as the drain progresses toward the lower end of the cut, but changes to flatter grades in that direction should not be abrupt, owing to the tendency of the drain to silt up when a marked reduction in the grade line is made in a short distance.

The greatest trouble in establishing grade lines for these drains is found in long cuts where the grade line of the track is level or nearly so. In such cases the upper end of the drain should be kept as high as possible to do so and still secure the desired result and then to get a grade line of at least 0.2 per cent to the lower end. If the track is level, excavation can often be saved by running the drain both ways from the center of the cut. Such conditions are not often found but they exist in certain places, especially

on some of the older roads in fairly level country, which were built when the importance of track drainage was not as fully appreciated as it is at the present time.

No matter what grade is adopted, the tile should be laid in such a manner that it will retain that grade, since any settlement after the pipe is installed will not only afford places for the deposit of silt but may result in the joints being pulled apart. Glazed bell and socket pipes should always be used for such installations, since they are stronger than the so-called farm tile, prevent the escape of water at the joints, and give less trouble from the joints pulling apart in the case of slight settlement. They also present a smoother surface for the passage of water, and this is quite important in the case of light gradients.

Oiling Rail Joints

What advantages, if any, are derived from oiling rail joints in dry climates where protection from brine drippings is not necessary? Does such oiling prevent the "freezing" of the joints and permit a readier adjustment of expansion and contraction?

It Saves the Bolts

By A. CHINN

Engineer Maintenance of Way, Chicago, Burlington & Quincy, Lincoln, Neb.

The greatest advantage of oiling rail joints in dry climates where trouble is not experienced with brine drippings is that the oil protects the threads of the bolts, preventing the nuts from "freezing" and making it possible to tighten the bolts with less likelihood of twisting them off. It is considered that the bolts saved in this way will alone pay for the small expense of oiling. Also, it is found that when the joints are released in connection with relaying rail, practically all of the bolts can be salvaged in excellent condition for use in secondary and yard tracks. The claim is made that oiled joints remain tight for a longer period than joints where oil is not used, but this feature has not been proved conclusively.

It is felt that a properly oiled joint will not "freeze" to the rails and will permit freer movement of the rail ends in adjusting themselves to expansion and contraction. By "properly oiled" is meant a joint in which the rail ends, for the length covered by the joint, and the inner faces of the joint bars are oiled before application and which are oiled on the outside at least once annually thereafter. Joints that have been applied several years, and which have already become "frozen" to the rail, will probably not be helped by oiling, so far as the "freezing" is concerned.

Will Not Prevent Freezing of Joints

By ENGINEER MAINTENANCE OF WAY

In dry climates when brine drippings are not encountered, the value of oiling joints depends on the amount of rust that forms on the bolts and on the rail at the joints. Studies and tests reported by the Committee on Stresses in Track of the American Railway Engineering Association have demonstrated that oiling the joints has little or no effect on the "freezing" of joints when the bolt tension exceeds 3,000 pounds, a tension much lower than is common in well-maintained track.

The oiling will, however, reduce wear on the rail and the joint bar where they come in contact and will also prevent the formation of rust on the bolts and nuts, thereby reducing the labor required for tightening bolts and tending to keep the joints in good condition by making it easy to tighten the bolts when necessary. The desirabiliy of oiling joints in dry climates depends, therefore, on the extent to which wear occurs on the rails and joint bars, as well as on the extent to which rusted bolts interfere with the work of keeping them tightened properly.

Few Places Where Oiling Doesn't Pay

By V. H. SHORE

Yard Foreman, Atchison, Topeka & Santa Fe, Dodge City, Kan.

There are very few places where there is not enough moisture to cause corrosion of the track joints. It is also true that there is very little track in main lines that does not carry considerable refrigerator freight at intervals in a year's time. The practice of oiling the fishing surfaces with a fair grade of black oil when the rail is being laid does much to prevent "freezing" of the joints and permits adjustment of expansion and contraction.

In the writer's experience, the oiling of rail joints on the outside, after they have been applied, only tends to protect the outside of the joints and the bolts from rust and does not prevent their freezing, as very little of the oil gets inside the joints. A little oil on the thread end of the bolts and nuts keeps them in such shape that they can be tightened when necessary or when it is desired to remove the bolts in changing out rail. Where no oil is used, the nuts become set with rust and it is often necessary to cut them from the bolts with a chisel, thereby losing the nut and often damaging the bolt to the extent that it is scrapped, adding considerable to the cost of maintenance.

In arid climates where joints are less affected with rust, they can be oiled less frequently, but a little oil on them, including the bolts, is time and money well spent.

Foundations of Existing Bridges

What is the best method of determining the foundations of piers and abutments of small bridges when the original records are not available?

It Depends Upon the Purpose

By C. F. LOWETH

Chief Engineer, Chicago, Milwaukee, St. Paul & Pacific, Chicago

The procedure to be followed in determining the character of foundations of an old bridge depends largely on the purpose for which the information is desired. However, in the case of most readers of *Railway Engineering and Maintenance*, I presume that there are two primary reasons for wanting to have such information (1) as a check on the security of an old structure; (2) for the purpose of determining the requirements of adequate foundations for a new structure at or near the site of the old bridge. The answer is substantially the same in both cases.

If the old structure has been in existence for some time and it is clearly evident that no unit of the substructure has been subject to any settlement, there is reasonable assurance that the foundations of the existing structure, whatever they may be, are adequate. This statement must be qualified, how-

ever, in the event that the bed of the stream at the site of the bridge is subject to scour, as it is entirely possible that an extraordinary stream discharge, such as would lead to excessive scour and endanger the security of the structure, has not occurred since it was built.

Under such circumstances, or in the event that the investigation is being made for the purpose of determining the character of foundations necessary for a new bridge, the obvious procedure is to make whatever investigation is necessary to determine the depth and nature of the foundation of the old piers. If the results of such an investigation, together with collateral facts concerning the bridge site, give rise to any question as to the adequacy of the old foundations, further investigation for the purpose of determining what is necessary to insure the thorough stability of the old structure, or to provide adequate foundations for a new one, must proceed on exactly the same basis as if no structure existed at the site in question.

The fact should not be overlooked that in some streams a comparatively slight relocation of piers or abutments may materially affect flood conditions in the stream and so call for foundations quite different from those of the old structure.

Depends on Various Local Conditions

By C. S. HERITAGE
Bridge Engineer, Kansas City Southern, Kansas City, Mo.

This question often confronts the engineer, especially where old structures are to be remodeled or replaced. The method used for determining the character of existing foundations will vary according to the local conditions.

For small bridges we can usually determine both the depth and dimensions of pier foundations by digging test holes at the sides and ends of the pier. This will also give information as to the character of the soil on which the footing rests. In the case of abutments, this method will show the position in front of the abutment, but it may be impractical to excavate behind the abutment, in which event the position of the footing behind the abutment can usually be determined by a sounding auger.

If the piers are in water, it will require the construction of a cofferdam to make investigations by excavating, although it may be possible to secure sufficient information with sounding bars or augers. If the foundations are on piles and no records are available, it will be practically impossible to determine the number and length of piles.

If the desired information is for the purpose of determining the stability of the foundation for heavier loading, the structures can be loaded as heavily as required for test purposes and careful observations taken of settlement, which will at least indicate something of the carrying capacity of the structure. For larger structures we are warranted in making more elaborate investigations. On the other hand, records are more likely to be available for the larger structures.

FACING A RAISE IN RENT.—The Moffat Tunnel Commission on January 30 served notice upon the Denver & Salt Lake that it would expect the railroad to pay a yearly rental of $560,067 for the use of the Moffat tunnel in Colorado instead of the rental of $345,000 per year specified in the present contract between the road and the commission.

WITH THE ASSOCIATIONS

American Railway Engineering Association

All indications point to a record-breaking attendance at the thirtieth annual convention, which will be held at the Palmer House, Chicago, on March 5-7, hotel reservations now exceeding those at this time in any previous year. Through the co-operation of the committees and special efforts by Secretary Fritch, all of the reports have been printed and distributed to the members, the last bulletin going into the mail on February 22.

The program for the convention is as follows, morning sessions beginning at 9 a. m. and afternoon sessions at 2 p. m.

First Day—Tuesday, March 5

President's address—W. D. Faucette
Reports of secretary and treasurer
Reports of committees on: Standardization
Water Service and Sanitation
Roadway
Ballast
Ties
Address—Southern Pacific New Bridge, by C. R. Harding, engineer of standards, S. P.
Reports of committees on: Uniform General Contract Forms
Shops and Locomotive Terminals
Clearances
Co-operative Relations with Universities
Evening—Visit to Railway Appliances Exhibit at Coliseum

Second Day—Wednesday, March 6

Reports of committees on: Rules and Organization
Yards and Terminals
Rivers and Harbors
Wood Preservation
Stresses in Railroad Track
Address by Major-General Edgar Jadwin, chief of engineers, United States Army.
Report of committees on: Grade Crossings
Track
Electricity
Signals and Interlocking

Third Day—Thursday, March 7

Reports of committees on: Iron and Steel Structures
Wooden Bridges and Trestles
Masonry
Records and Accounts
Buildings
Address by O. H. Caldwell, member, Federal Radio Commission
Reports of committees on: Rail
Economics of Railway Location
Economics of Railway Operation
Economics of Railway Labor

Roadmasters' Association

The members of the executive committee, the chairmen of the standing committees and the members of the committee on arrangements for the next annual convention will meet at the Palmer House, Chicago, for dinner and conference at 6:30 on Monday evening, March 4.

In addition to selecting the personnel of the committees to report on technical subjects at the convention next September, as announced in the January issue, President H. R. Clarke has appointed the following members of a committee to present at the next convention a suggested list of subjects for consideration by the association during the year 1929-30:

Chairman, Elmer T. Howson, editor, *Railway Engineering*

and Maintenance; Chicago; E. E. Crowley, roadmaster, D. & H., Oneonta, N. Y.; C. W. Baldridge, assistant engineer, A. T. & S. F., Chicago; William Shea, general roadmaster, C. M. St. P. & P., Chicago; W. O. Frame, district engineer, C. B. & Q., Burlington, Ia.; E. P. Safford, supervisor, N. Y. C., Silver Creek, N. Y.; D. E. Callahan, supervisor, Penna., Pittsburgh, Pa.; J. A. Snyder, division engineer, M. C., Detroit, Mich.; I. D. Talmadge, roadmaster, N. Y. O. & W., Middletown, N. Y.; D. Valier, supervisor, B. & M., Boston, Mass.; R. S. Kittredge, cost engineer, H. V., Columbus, Ohio; J. J. Gallagher, roadmaster, M.-K.-T., Boonville, Mo.; W. A. Enderle, roadmaster, S. P., San Antonio, Tex.; L. Coffel, supervisor, C. & E. I., Momence, Ill.; and J. Ferguson, division engineer, C. N. R., Cochrane, Ont.

Maintenance of Way Club of Chicago

At a meeting on Wednesday evening, February 20, Charles W. Gennet, Jr., vice-president, Sperry Rail Service Corporation, Chicago, spoke on the development and work of the Sperry transverse fissure detector. The attendance approximated 115. The membership of this organization, which is local to Chicago and the immediate vicinity, is now 241.

At the next regular meeting of the Club, which will be held at the Auditorium hotel on Wednesday evening, March 20, John Mabile, supervisor of work equipment, C. R. I. & P., will speak on the maintenance and operation of work equipment.

Bridge and Building Association

Committees charged with responsibility for preparing reports on the subjects adopted for presentation at the convention in October were selected by the executive committee at a meeting in Chicago on January 5, and the chairmen of the committees have all accepted appointment. The subjects assigned for study and report, together with the personnel of each committee, are as follows:

The Selection and Training of Men for the Position of Foreman: C. J. Geyer, engineer of maintenance of way, C. & O., Richmond, Va.; G. S. Crites, vice-chairman, division engineer, B. & O., Baltimore, Md.; C. E. Brightwell, supervisor water service, C. & O., Huntington, W. Va.; V. S. Brokaw, assistant engineer, C. M. St. P. & P., Chicago; F. P. Farrel, supervisor water service, M. P., Pueblo, Colo.; W. C. Harman, supervisor bridges and buildings, S. P., Bakersfield, Cal.; D. T. Rintoul, general bridge inspector, S. P. San Francisco, Cal.; W. A. Stewart, assistant superintendent bridges and buildings, Cen, Vt., New London, Conn.; W. G. Swartz, engineering accountant, C. N. R., Toronto, Ont.; S. C. Tanner, superintendent maintenance of way shop, B. & O., Martinsburg, W. Va.; C. D. Turley, assistant engineer, I. C., Chicago; J. J. Wishart, supervisor bridges and buildings, N. Y. N. H. & H., Boston, Mass.; and J. P. Wood, supervisor bridges and buildings, P. M., Saginaw Mich

Wearing Surfaces for Passenger and Freight Platforms: Wm. Cardwell, chairman, supervisor bridges and buildings, Wash. Term., Washington, D. C.; F. M. Lehrman, vice-chairman, draftsman, C. & N. W., Chicago; E. E. Candee, supervisor bridges and buildings, N. Y. N. H. & H., New Haven, Conn.; John Harden, assistant superintendent buildings, M. C., Jackson, Mich.; R. C. Henderson, master carpenter, B. & O., Dayton, Ohio; J. E. King, general supervisor bridges and buildings, C. & O., Richmond, Va.; Sam Lincoln, general foreman bridges and buildings, G. C. & S. F., Beaumont, Tex.; E. J. Rykenboer, supervisor bridges and buildings, N. Y. C., Rochester, N. Y.; F. H. Soothill, chief estimator, I. C., Chicago; H. C. Swartz, superintendent bridges and buildings, C. N. R., Montreal, Que.; and C. W. Wright, master carpenter, L. I., Jamaica, N. Y.

Relative Economy of Concrete Mixes and Practical Tests for Concrete Aggregates: F. H. Cramer, assistant bridge engineer, C. B. & Q., Chicago; H. C. Munson, vice-chairman, assistant engineer, C. M. St. P. & P., Chicago; H. I. Benjamin, assistant engineer bridges, S. P., San Francisco, Cal.; A. I. Gauthier, supervisor bridges and buildings, B. & M., Concord, N. H.; W. A. Hucheson, assistant supervisor bridges and buildings, C. & O., Clifton Forge, Va.; A. C. Irwin, manager railways bureau, Portland Cement Assoc., Chicago; W. S. Lacher, managing editor, *Railway Engineering and Maintenance,* Chicago; R. W. Mitchell, general foreman, B. & O., Baltimore, Md.; W. V. Parker, foreman of construction, St. L. S. W., Paragould, Ark.; T. W. Pinard, assistant chief engineer, maintenance of way, Penna., Chicago; George Sawyer, supervisor of masons, D. & H., Oneonta, N. Y.; and G. E. Tebbets, engineer of structures, Chicago Rapid Transit, Chicago.

Reducing the Cost of Maintaining Roadway Buildings and Small Stations: F. W. Hillman, chairman, asst. engineer maintenance, C. & N. W., Chicago; P. Aagaard, vice-chairman, general building inspector, I. C., Chicago; E. H. Brown, supervisor bridges and buildings, N. P., Minneapolis, Minn.; G. M. Haley, supervisor bridges and buildings, L. A. & St. L. (U. P.), Salt Lake City, Utah; W. J. Lacy, supervisor bridges and buildings, M. P., Poplar Bluff, Mo.; W. J. H. Manning, division engineer, D. & H., Plattsburgh, N. Y.; C. J. McCarthy, chief carpenter, C. M. St. P. & P., Aberdeen, S. D.; P. N. Nelson, supervisor bridges and buildings, S. P., San Francisco, Cal.; E. C. Neville, master bridges and buildings, C. N. R., Toronto, Ont.; and Kemper Peabody, general supervisor buildings, N. Y. C., New York.

The Inspection and Maintenance of Track Scales: E. K. Lawrence, chairman, general scale inspector, B. & O., Baltimore, Md.; H. H. Best, vice-chairman, supervisor bridges and buildings, M. P., Little Rock, Ark.; G. A. Easton, general scale inspector, S. P., West Oakland, Cal.; J. S. Ekey, supervisor of structures, B. & L. E., Greenville, Pa.; V. E. Engman, chief carpenter, C. M. St. P. & P., Terre Haute, Ind.; R. H. Gilkey, roadmaster, C. of Ga., Savannah, Ga.; H. A. Horning, superintendent buildings, M. C., Jackson, Mich.; A. L. McCloy, supervisor bridges and buildings, P. M., Saginaw, Mich.; C. E. Miller, supervisor scales and work equipment, C. & N. W., Chicago; C. Pettis, general scale inspector, N. Y. C., Rochester, N. Y.; L. C. Smith, supervisor bridges and buildings, I. H. B. Hammond, Ind.; and H. E. Wells, general foreman bridges and buildings, A. T. & S. F., Marceline, Mo.

The Maintenance of Water-Transfer Facilities for Railway Equipment: C. W. Boyce, chairman, supervisor bridges and buildings, Y. & M. V., Vicksburg, Miss.; F. J. Welch, vice-chairman, chief carpenter, C. M. St. P. & P., Tacoma, Wash.; T. W. Bratten, supervisor bridges and buildings, S. P., Oakland Pier, Cal.; R. J. Bruce, general supervisor bridges and buildings, M. P., St. Louis, Mo.; J. B. Livingstone, supervisor bridges and buildings, St. L. S. W., Illmo, Mo.; C. U. Smith, harbor terminal director, Milwaukee, Wis.; M. A. Smith, supervisor bridges and buildings, I. C., New Orleans, La.; B. F. Stidfole, master carpenter, Penna., Elizabeth, N. J.; E. D. Story, supervisor bridges and buildings, F. E. C., West Palm Beach, Fla.; F. C. Tranzow, supervisor bridges and buildings, G. T., Durand, Mich.; E. E. R. Tratman, western editor, Engineering News Record, Chicago; and T. B. Turnbull, supervisor bridges and buildings, A. A., Owosso, Mich.

The Protection of Underground Pipe Lines from Deterioration: W. E. Pierce, chairman, supervisor water service, D. & H., Oneonta, N. Y.; O. C. Anderson, vice-chairman, water service foreman, S. P., San Francisco, Cal.; G. E. Boyd, associate editor, Railway Age, Chicago; J. H. Bugg, supervisor water service, C. N. R., London, Ont.; R. T. Burns, supervisor water service, C. & N. W., Boone, Iowa; W. R. Edwards, general bridge inspector, B. & O., Baltimore, Md.; Wm. Gilbert, inspector water supply, C. & O., Huntington, W. Va.; M. M. Munson, inspector water service, M. P., Kansas City, Mo.; T. E. O'Brien, bridge and building master, D. & H., Carbondale, Pa.; L. C. Prunty, general foreman water service, U. P., Kansas City, Mo.; and W. L. Wallace, water service superintendent, P. M., Saginaw, Mich.

The Elimination of Accidents to Bridge and Building Men Working Off the Ground: W. R. Roof, chairman, bridge engineer, C. G. W., Chicago; L. M. Bates, vice-chairman, division engineer, C. & N. W., South Pekin, Ill.; D. C. Barrett, division engineer, C. & N. W., Winona, Minn.; W. J. Bennett, assistant engineer, G. N., Seattle, Wash.; Charles Harrison, foreman bridges and buildings, Mid. Val., Muskogee, Okla.; F. G. Hawken, general foreman, D. S. S. & A., Marquette, Mich.; J. P. Hofacker, supervisor bridges and buildings, L. V., Auburn, N. Y.; R. W. Johnson, assistant engineer, C. M. St. P. & P., Chicago; C. G. Linstrom, foreman, bridges and buildings, C. M. St. P. & P., Rockwell City, Iowa; F. H. Masters, assistant chief engineer, E. J. & E., Joliet, Ill.; C. L. Metzmaker, superintendent bridges and buildings, C. & I. M., Springfield, Ill.; A. V. Rohweder, superintendent safety, D. M. & N., Duluth, Minn.; and Wm. Shively, master of bridges, C. R. R. of N. J., Jersey City, N. J.

RAILWAY NEWS BRIEFLY TOLD

Revenue freight car loadings for the week ended February 9 totaled 955,478, an increase of 49,001 cars as compared with the corresponding week in 1928. Cumulative loadings for the first six weeks of this year amounted to 5,473,348, as compared with 5,281,634 and 5,685,926 during the corresponding periods in 1928 and 1927, respectively.

The attorney general of Nebraska, in an opinion given to the Nebraska State Railroad Commission, holds that a railroad does not violate the state law by operating a work train with only one brakeman. He declared that the courts have held that the law which specifies the number of brakemen to be employed on a train is not broad enough to include either mixed trains or work trains.

The courses in railway transportation, which were given experimentally at the Harvard Graduate School of Business Administration, Cambridge, Mass., during the summer of 1928 by Professor William J. Cunningham of Harvard and Professor Winthrop M. Daniels of Yale, will again be included this year in a special session from July 1 to August 10. As in the 1928 sessions, the procedure of instruction will be based on the case system, which is the method employed at the regular winter sessions of the school. This involves the classroom discussion of principles underlying actual experiences, policies and decisions of executives who have released such information and permitted its use as material for the course.

The Pennsylvania has increased the pay of employees in the maintenance of way and structures department, effective February 1, by about $450,000 a year, by which action between 7,000 and 8,000 employees will receive advances in pay. Track foremen are advanced $2.50 a month, while bridge and building foremen, together with inspectors and their assistants, receive an advance of $5 a month. Water-service repair men, plumbers, blacksmiths, machinists, motor-car repair men, electricians, and cabinet and bench carpenters receive an additional four cents an hour and track laborers, assistant foremen, carpenters, painters, masons, iron workers, pumpers, teamsters, chauffeurs and work equipment engineers and firemen have their pay increased by one cent an hour.

The Colorado & Southern, at a hearing befare an examiner of the Interstate Commerce Commission at Denver, Colo., during the early part of February, on its application for permission to abandon its narrow-gauge line and braches between Waterton, Colo., and Leadville, 185 miles, offered to give the line to any person or group of persons who would undertake to operate it, with the proviso that it be returned for junking at any time that it might cease operations. While several offers are reported to have been made to take the line on these terms, it is significant that none of them was said to have come from railroad men and nothing was said as to the financial status of those who made the offers. C. W. Link, chairman of the Colorado State Tax Commission, testified that the C. & S. reports an annual loss of $423,000 on the line in question.

The Northern Pacific has awarded a contract to Foley Brothers, Inc., St. Paul, Minn., for the operation of its coal field at Colstrip, Mont., which will involve the handling of 20,000,000 cu. yds. of earth excavation and the loading of 12,000,000 tons of coal during a period of 10 years. The vein of coal is 27 ft. thick, overlaid with earth ranging from 10 to 50 ft. in thickness and both the overburden and the coal will be handled by electric shovels. At the present time the pit is 900 ft. wide and more than 2.5 miles long. In addition to the three electric shovels now in operation, a contract has been placed for the construction of a stripping shovel and a loading shovel of large capacity. The stripping shovel will be equipped with a boom 120 ft. long and with a dipper with a capacity of 10 cu. yd. The loading shovel will have a dipper of 9 cu. yd. capacity and will be able to load coal at the rate of 500 tons per hour.

P. E. Crowley, president of the New York Central, on February 13 awarded silver trophies to the Cleveland, Cincinnati, Chicago & St. Louis and the Chicago River & Indiana, for the greatest improvement in safety work among employees during 1928, one of the trophies being given to the leader of the large roads in the system and a duplicate to the road making the best record among the small units. The Chicago River & Indiana had no fatal accidents among its employees in 1928, the first year in its history in which such a record has been attained. C. E. Hill, general safety agent of the N. Y. C., speaking before a large gathering of officers of the system, gave a brief statement of the improvement in safety among employees on that system since 1923, citing the record which shows a reduction in non-fatal injuries from 13,437 to 4,695 during the same period. During the same time, fatalities among passengers had decreased about 62 per cent while injuries to passers showed a reduction of 88 per cent.

The Hudson Bay Railway, at the end of the construction season of 1928, had advanced to within 50 miles of its terminus at Ft. Churchill, Man., and it is expected that by the end of 1929 a workable line, capable of carrying freight trains, will be carried to that point. To accomplish this the last few miles of track at the end of 1929 will be laid on the snow after the ground has frozen solidly, on which trains will operate until the break-up in the spring, when ballast will be unloaded by train for surfacing of the track. This procedure will permit the taking in of a large amount of material for the construction of the harbor at Ft. Churchill during the winter of 1929-30.

Thomas H. Carrow, superintendent of safety of the Pennsylvania, at a meeting of safety specialists in New York, illustrated his account of what is being done on the Pennsylvania by citing the results of a recent two-weeks test in which supervisory officers made a record of violations of rules which did not cause any loss, injury or damage, but which called for a caution or reprimand. From these records the following illustrative instances are copied as affecting the maintenance of way department:

Track Foreman—Failed to use goggles when cutting rail.

Painter—Using defective ladder.

Carpenter — Improper use of track dolly.

Trackwalker — Not keeping proper lookout.

Laborer—Crawling under stored engine.

Laborer—Using claw bar improperly.

Laborer—Using defective tool.

Laborer—Allowing tools to lie around.

Laborer—Riding on end sill of car.

Mr. Carrow's code of principles for the activities in the safety departments begins with the following paragraph:

"All violations of rules, all acts of negligence or carelessness and all unsafe methods of work which might result in accident, shall be considered just as serious and shall receive the same attention and cause the same action to be taken by officers and supervisory forces as if an accident resulted."

Construction News

The Canadian Pacific plans to apply to the next session of federal parliament for charter rights to construct a railroad between Kootenay Landing, B. C., and Proctor, about 30 miles, along the west shore of Kootenay lake. The railroad has also asked authority to issue $1,500,000 of securities to cover the cost of construction.

The Chesapeake & Ohio plans the expenditure of approximately $3,927,000 in and near Russell, Ky., for the construction of new freight car repair shops, including buildings, power house, machinery, etc., with a capacity for 12,000 freight cars per year. This project also includes an underpass and run-around tracks under the main tracks in the east end yard to connect yards and roundhouses; new yard facilities including new trackage, rearrangement of switches, installation of car retarders and revision of grades. Other improvements by this road include additions and betterments to the engine terminal at Stevens, Ky., including an extension of 13 stalls, a coaling station and other facilities to cost approximately $594,000; engine terminal improvements, including a 400-ton coaling station at Cheviot, Ohio; and the strengthening of 11 bridges on the Greenbrier subdivision, to accommodate heavier engines.

The construction of light repair tracks which will have a capacity of 133 cars at Peru, Ind., at a cost of $90,500 is also planned as part of its general improvement program for 1929. At the same point, $22,000 will be expended for the relocation of the freight station and the construction of additional freight station facilities. Other projects include the construction of a one-story brick passenger station at Paintsville, Ky., at a cost of $104,500 and second main track between Sciotoville, Ohio, and Wheeler, four miles, at a cost of $961,000. A total of $18,403,000 is expected to be spent by the Chesapeake & Ohio for improvements, extensions and betterments during the year 1929.

The Lehigh Valley has started construction work on a retail coal plant at Jersey City, that is said to be the largest of its kind in the East. It is located on the Hudson river adjacent to the Holland Tube and the Pennsylvania ferry piers and will be occupied by Burns Brothers for local distribution of the Lehigh Valley Coal Company's anthracite coal.

The Mobile & Ohio plans the construction of an 18-stall roundhouse, boiler house and a locker building at East St. Louis, Ill., which will cost about $225,000.

The National Lines of Mexico has under construction new water stations which will involve a total expenditure of about $210,000.

At the close of 1928 this company had under construction or nearing completion improvements to buildings and roadway involving a total expenditure of about $1,222,000. The more important projects include construction of a locomotive repair shop at Nonoalco, D. F., which will have 10 inspection pits and one general repair pit and cranes of 60 tons and 20 tons capacity, at a cost of $247,000; rearrangement of Colonia station, Mexico, D. F., to provide space for express storage and offices and additional capacity in the entrances, concourses and station facilities at a cost of $185,000; conversion of a two-story brick station at Saltillo, Coah., into a concentration hospital at a cost of $49,000, and the conversion of a station building on the Durango division into a hospital at a cost of $16,000. Projects of lesser importance, for which $765,100 has been expended, include the construction and reconstruction of stations and cattle pens, the construction and reconstruction of storehouses and warehouses, employees dwellings, and yard towers, paving of station grounds and construction of inspection pits.

The New York Central has applied to the Public Service Commission of New York for the right to exercise a franchise to build and operate a branch track from its Oswegatchie line, about 3,300 ft. west of Emeryville station, St. Lawrence county, N. Y., south a distance of about four miles to the mines of the St. Joseph Lead Company. The proposed branch is to provide shipping facilities for the mining company and is expected to move about 1,900 cars per year. The railroad's plan calls for crossing three town highways at grade and carrying the track over the state highway on a bridge, thereby making no change in the existing grade of the highway.

The construction of a new freight and switching yard with a capacity of 2,000 freight cars is planned at Black Rock, north of Buffalo, N. Y. The company has taken option on 128 acres of land just north of the Buffalo city line and plans to start construction early in the spring. The yard will first be developed for a capacity of 560 cars. The new project will serve the industrial territory between Black Rock and Tonawanda, N. Y.

Contracts for construction work on its lines have been awarded as follows: Elimination of a grade crossing at Lake Clear Junction, N. Y., to Walsh Construction Company, Syracuse, N. Y.; reconstruction of a bridge at Port Morris, N. Y., to Leake & Nelson Co., Inc., Bridgeport, Conn.; construction of foundation for a grain drier, Pier 7, West New York, N. J., to Allen Spooner & Son, New York; construction of a signal station and repair shop, West Bergen, N. Y., to Gorsline & Swan Construction Company, Rochester, N. Y.; construction of a Pullman service building, Buffalo, N. Y., to E. P. Muntz, Inc., Buffalo, N. Y.

The Pennsylvania has awarded a contract to the M. A. Long Company, Baltimore, Md., for the construction of produce store buildings for the Potomac Freight Terminals Company, fronting on Water street between Twelfth and Thirteen-and-one-half streets, N. W., in Washington, D. C., at a cost of approximately $380,000. A contract for the erection of the steel work for a viaduct across Legionville Hollow and a bridge over Township Road on its Economy branch extension at Legionville, Pa., has been given to the American Bridge Company, Pittsburgh, Pa.

The City of Cincinnati, Ohio, will share in the cost of constructing a viaduct over the railroad's tracks, which will eliminate grade crossings at Beechmont and Eastern avenues, at Linwood road and Hutton street in that city. Of the total cost of the structure of $746,000, $484,900 will be paid by the Pennsylvania.

A contract has been awarded to Gibbs & Hill, Inc., New York, for the enclosure of the exit concourse at the Pennsylvania station in New York at an approximate cost of $150,000.

The South Plains & Santa Fe has applied to the Interstate Commerce Commission for authority to build a line from Seagraves, Tex., to Lovington, with a 15-mile branch along the Texas-New Mexico state line, a total of 89.5 miles.

The St. Louis, San Francisco & Texas, in various applications filed with the Interstate Commerce Commission, has asked for authority for the construction of extensions of this line and the Gulf, Texas & Western to afford an additional through route between Amarillo and Vernon, and Fort Worth, Tex. The St. Louis-San Francisco has applied for authority to acquire control of the Gulf, Texas & Western, extending from Salesville Junction to Seymour, Tex., 99 miles, and the latter has applied for authority to build an extension from Seymour to a point near Paducah, 71 miles. The St. L., S. F. & T. also asks authority to extend its line from Vernon to Seymour, 42 miles, thus connecting the line of the G. T. & W., with the line of the Frisco system, and also authority to acquire trackage rights over a line of the Chicago, Rock Island & Gulf between Jacksboro and Fort Worth, 71.6 miles. It is stated that the C. R. I. & G. will ask for a certificate for the construction of a line from Groom to Paducah and for the acquisition by joint trackage agreement of a line between Paducah and Jacksboro.

The St. Louis Southwestern plans to expend $3,683,300 during 1929 for the revision of line and reduction of grades between Mt. Pleasant, Tex., and Waco. Additional yard facilities at Tyler, Tex., will involve an expenditure of $621,000 and $300,000 will be spent for improvements to shops at Pine Bluff, Ark., and Tyler.

Supply Trade News

General

The National Accessories Company, Inc., Philadelphia, has been appointed railroad representative for the Philip Carey Company, Cincinnati, Ohio.

The Prest-O-Lite Company, Inc., New York, has opened a new acetylene plant at Memphis, Tenn., for supplying dissolved acetylene for oxy-acetylene cutting and welding. **J. Brown** has been appointed superintendent of the plant.

The Ash Grove Lime & Portland Cement Company, Omaha, Neb., is building a modern cement plant at Louisville, Neb., which is nearing completion and which will be in operation in the spring. The buildings are of reinforced concrete and steel and cover several acres.

Personal

R. F. Crego, formerly sales manager of the L. C. Smith Bearing Company, Chicago, has been appointed representative of the Foote Bros. Gear & Machine Company, Chicago.

Walter S. Campbell, railroad sales representative for the western district of Joseph T. Ryerson & Son, Inc., Chicago, with headquarters at Jersey City, N. J., resigned on February 1 to engage in other business.

Otis B. Duncan, industrial agent, Chicago, has been appointed by the Wood Shovel & Tool Co., of Piqua, Ohio, and the American Switch Point Protector & Railroad Equipment Co., Denver, Colo., as the representative of these two companies in the middle west.

H. E. McKee, assistant general manager of the Electric Railweld Service Corporation, Chicago, with headquarters in Chicago, has been promoted to general manager, with headquarters in the same city, to take over the duties of that position which were formerly performed by **H. W. Morrison,** president.

R. L. Nutt, Jr., National Bank of Commerce building, Norfolk, Va., has been appointed district sales representative in Virginia for the Woodings Forge & Tool Company, Verona, Pa., and **Wm. Z. Coleman,** of T. C. Coleman & Sons, Starke building, Louisville, Ky., has been appointed district sales representative in Kentucky and Tennessee.

F. E. Bauer, Jr., who has represented the American Hoist & Derrick Company, St. Paul, Minn., in the foreign field for many years, has been appointed export sales manager, with headquarters at 50 Church Street, New York. **Boyd Nixon** has been placed in charge of a branch office which that company has opened at 139 Townsend street, San Francisco, Cal.

Personal Mention

General

John J. Pelley, president of the Central of Georgia, with headquarters at Savannah, Ga., whose early railway experience was gained in the maintenance of way department, has been elected president of the New York, New Haven & Hartford with headquarters at New Haven, Conn., succeeding **Edward J. Pearson,** deceased. Mr. Pelley was born on May 1, 1878,

John J. Pelley

at Anna, Ill., and entered railway service as a track apprentice on the Carbondale division of the Illinois Central. He was promoted to supervisor on the Indiana division in 1904 and was transferred to the Memphis division in the following year. This was followed in 1908 by his promotion to roadmaster of the Louisiana division, with headquarters at McComb, Miss., and from there he was transferred to the Tennessee division, with headquarters at Fulton, Ky., in 1911. Mr. Pelley entered the operating department in 1912 as superintendent of the Tennessee division and in 1917 was promoted to general superintendent of the Southern Lines, with headquarters at New Orleans, La. Mr. Pelley later retired tempararily from the service of the Illinois Central to engage in work with the Car Service Division of the American Railway Association but returned to that road on April 1, 1923, as general manager. He was promoted to vice-president in December, 1924, and in September, 1926, was elected president of the Central of Georgia, which position he was holding at the time of his election to the presidency of the New Haven.

R. L. Longshore, division engineer of the Detroit division of the Wabash, with headquarters at Montpelier, Ohio, has been promoted to general manager of the Toledo & Western, a subsidiary of the Wabash, with headquarters at Toledo, Ohio. Mr. Longshore was born on June 30, 1891, at Ossian, Mich., and was educated at Tri-State College (Angola, Ind.). He entered railway service in 1910 as a rodman on the Oregon Short Line, leaving this work in the following year to become a rodman on irrigation work in Oregon. He re-entered railway service in 1912 as an assistant on an engineer corps on the Grand Rapids & Indiana (now a part of the Pennsylvania) at Ft. Wayne, Ind. He again left railway service in 1913, to become an instrumentman on surveys for power sites in Michigan and later was deputy surveyor of Adams County, Ind. Mr. Longshore was made assistant engineer on the Wabash at Montpelier in 1917, and on October 21, 1921, he was made supervisor at the same point, later being transferred to Chicago. In 1922, he was promoted to assistant engineer at St. Louis, Mo., and on June 1, of the following year, was promoted to division engineer with headquarters at Detroit. Mr. Longshore was transferred to Montpelier, where he was located at the time of his promotion to general manager of the Toledo & Western on February 1.

H. O. Kelley, general manager of the Toledo & Western, a subsidiary of the Wabash, with headquarters at Sylvania, Ohio, who is an engineer by education and experience, has been appointed superintendent of the Springfield division of the Wabash, with headquarters at Springfield, Ill. Mr. Kelley graduated from Rose Polytechnic Institute in 1913 and entered railway service in the same year as a rodman on the Chicago & Eastern Illinois at Evansville, Ind., afterwards acting in various capacities on the Evansville and Illinois divisions until March, 1916, when he was promoted to engineer maintenance of way of the Evansville & Indianapolis (now a part of the Cleveland, Cincinnati, Chicago & St. Louis) at Evansville. In June, 1916, Mr. Kelley was appointed assistant engineer on the Wabash at St. Louis, Mo., and in December, 1919, was promoted to division engineer of the St. Louis Terminal division. During 1920 and 1921, he served as special engineer and in September of the latter year was appointed division engineer of the Western division at Moberly, Mo., being transferred to Peru division at Peru, Ind., in October, 1923. In August, 1924, Mr. Kelley was promoted to general manager of the Toledo & Western, which position he was holding at the time of his appointment as superintendent of the Springfield division of the Wabash.

Engineering

John E. Bailly, Jr., has been appointed assistant valuation engineer of the Elgin, Joliet & Eastern, with headquarters at Joliet, Ill.

J. J. Gallagher has been promoted to district engineer on the Missouri-Kansas-Texas with headquarters at Smithville, Tex., to succeed **W. C. Pruett,** who has been transferred to

Muskogee, Okla., to take the place of **Arthur Harvey,** who has joined the sales force of the American Hoist & Derrick Company, St. Paul, Minn., with headquarters at Chicago, as noted in the February issue.

C. H. Cravens has been appointed division engineer of the Kansas City, Mexico & Orient of Texas, with headquarters at San Angelo, Tex.

L. L. Wiggins, supervisor of track on the Rutland, with headquarters at Malone, N. Y., has been promoted to office and valuation engineer, with headquarters at Rutland, Vt., succeeding **F. R. Stevens,** deceased.

C. F. Schaeffer, assistant engineer on the St. Louis-San Francisco at Chaffee, Mo., has been transferred to Sapulpa, Okla., to succeed **Q. Baker,** whose promotion to roadmaster is noted elsewhere in this issue.

R. A. Van Ness, resident engineer in the bridge department of the Atchison, Topeka & Santa Fe system, has been promoted to bridge engineer of the system to succeed **A. F. Robinson,** notice of whose death was published in the February issue.

J. A. Irvine, division engineer of the London division of the Canadian Pacific, with headquarters at London, Ont., has been transferred to the Schreiber division with headquarters at Schreiber, Ont., to succeed **E. M. Jelly,** who has been transferred to the Brownville division, with headquarters at Brownville Junction, Me., where he replaces **A. O. Wolff,** who has been transferred to the London division at London, to succeed Mr. Irvine.

W. W. Patchell, supervisor on the Panhandle division of the Central region of the Pennsylvania, has been promoted to division engineer on the Cumberland Valley division with headquarters at Chambersburg, Pa., where he will take the place of **E. C. Oyler,** who has been promoted to assistant to the engineer maintenance of way on the Eastern Pennsylvania division. **F. H. Lewis,** supervisor on the Baltimore division at Washington, D. C., has been promoted to division engineer of the Delaware and Norfolk divisions.

A. B. Chaney, assistant engineer on the Missouri Pacific at Van Buren, Ark., has been promoted to division engineer of the Little Rock division, with headquarters at McGehee, Ark., to succeed **J. S. Bassett,** who has been transferred to Little Rock, Ark., where he will have jurisdiction over the Little Rock, Hot Springs, Norman, Pike City and Nashville districts of the Arkansas division, a newly created position. The territory of **H. D. Knecht,** division engineer on the Arkansas division at Little Rock, will hereafter embrace the Hoxee and Doniphan districts and the Little Rock, terminal. **G. S. Smith,** assistant engineer, with headquarters at St. Louis, Mo., has been promoted to division engineer of the Louisiana division, with headquarters at Monroe, La., to take the place of **V. C. Halpin,** who has been transferred to the Central Kansas division, with headquarters at Osawatomie, Kan., where he succeeds **E. P. Hawkins,** who retired from the active service on February 19.

C. A. Johnston, track supervisor on the Chicago Terminal division of the Wabash, has been promoted to division engineer of the Detroit division, with headquarters at Montpelier, Ohio, succeeding **R. L. Longshore,** whose promotion to general manager of the Toledo & Western, with headquarters at Toledo, Ohio, is noted elsewhere in this issue. **C. T. Warren,** maintenance inspector, has been promoted to acting division engineer of the Detroit Terminal division, with headquarters at Detroit, Mich., to succeed **J. C. Bousfield,** who has been appointed resident engineer on the construction of the Union Produce terminal at Detroit.

L. J. Hughes, special engineer on the Chicago, Rock Island & Pacific, whose promotion to engineer maintenance of way with headquarters at Chicago, was noted in the February issue, was born at Billerica, P. Q., on May 24, 1884, and graduated from Rensselaer Polytechnic Institute in 1905. After serving in the engineering departments of the Illinois Tunnel Company and the American Bridge Company, Mr. Hughes entered railroad service on October 1, 1906, as a draftsman in the bridge department of the Rock Island and in 1910 was promoted to assistant engineer at Davenport, Iowa. In 1911, he was promoted to division engineer at Dalhart, Tex., and was transferred successively to Eldon, Mo., and Herington, Kan. In 1917, he was promoted to special engineer, reporting to the chief engineer. During the World War, Mr. Hughes was a lieutenant in the First Engineers, Illinois National Guard, and later in the 108th Engineers. In France, he was promoted to Captain in the latter unit and served with the 33rd division in the Somme, St. Mihiel and Meuse-Argonne offensives. On his return to civil life in 1919, he was appointed general inspector of maintenance of way of the corporate organization of the Rock Island and later was promoted to division engineer of the Chicago Terminal division. In 1923, he was further promoted to special engineer, reporting to the chief engineer, which position he was holding at the time of his promotion to engineer maintenance of way on February 1.

L. J. Hughes

J. George Bloom, whose retirement as engineer maintenance of way of the Chicago, Rock Island & Pacific was noted in the February issue, was born on November 25, 1869, at Xenia, Ohio, and graduated from Ohio State University. He entered railway service in August, 1889, as a chainman on the Pennsylvania and thereafter, for the following 14 years, was assistant engineer for the Kenova Land Association, assistant supervisor on the Norfolk & Western, and successively assistant engineer, division engineer principal assistant engineer and division engineer on the Baltimore & Ohio Southwestern (now a part of the Baltimore & Ohio) and division engineer on the B. & O., at New Castle, Pa. In June, 1903, Mr. Bloom was appointed district engineer on the Rock Island, with headquarters at Topeka, Kan., and later served as engineer of maintenance and district engineer of the Southwestern and Choctaw districts He left railway service in 1909 to become president of the Southern Ballast Company at Denison, Tex., and in July, 1912, he was appointed superintendent of construction of the John F. Stevens Company at New York. In 1914, he returned to the Rock Island to become connected with the valuation department at Chicago and in July, 1916, was promoted to superintendent of the Amarillo division with headquarters at Amarillo, Tex., later being transferred to the Louisiana division at El Dorado, Ark. In May, 1921, Mr. Bloom was appointed division engineer of the Nebraska-Colorado division, with headquarters at Fairbury, Neb., and he was further promoted to engineer maintenance of way of the system in May,

J. George Bloom

1922, which position he was holding at the time of his retirement on February 1.

Ralph R. Strother, assistant engineer on the Chicago, St. Paul, Minneapolis & Omaha, with headquarters at St. Paul, Minn., has been promoted to assistant chief engineer, with headquarters at the same point, to succeed **H. P. Padley,** who has retired under the pension rules of that road.

Mr. Padley was born on January 2, 1859 at Lincoln, England, and was educated in private schools for the engineering profession, later serving for a short time in the British Army. He came to the United States in 1886 and in the following year was appointed superintendent of construction for a contracting firm at Ashland, Wis., being admitted to partnership in the same firm in 1890. Mr. Padley was engaged in active military service in Cuba during the Spanish-American war and on his return to this country became a transitman on the Omaha in January, 1899. He was promoted to assistant engineer at St. Paul in 1909, and to principal assistant engineer at the same point in October, 1913. In March, 1920, Mr. Padley was promoted to assistant chief engineer, which position he was holding at the time of his retirement on February 1.

S. H. Kuhn, whose promotion to assistant to the engineer maintenance of way of the Lake division of the Pennsylvania, with headquarters at Cleveland, Ohio, was noted in the February issue, was born on December 19, 1879, at Altoona, Pa. He graduated from Penn State College in 1901, and

S. H. Kuhn

from June of that year to December, 1904, he served as rodman and transitman on the Middle division, with headquarters at Altoona. In December, 1904, he was promoted to assistant supervisor on the Philadelphia division, where he remained until March, 1909, when he was promoted to supervisor, serving respectively on the Pittsburgh, Buffalo and Schuylkill divisions until July, 1917. Mr. Kuhn then served as pilot engineer until November, 1917, when he returned to the position of supervisor, holding this position first on the Allegheny division and then on the Panhandle division. He was holding the position of supervisor on the Panhandle division at Burgettstown, Pa., at the time of his recent promotion.

Track

C. F. Forstall, assistant supervisor on the Reading at Pottstown, Pa., has been promoted to acting supervisor at Spring Garden Street, Philadelphia, Pa., succeeding **S. V. Keeler,** who has been transferred to Boiling Springs, Pa.

Michel Gawron, track foreman on the New York Central, has been appointed assistant supervisor on the Buffalo division, with headquarters at Tonawanda, N. Y., succeeding **J. W. Donelon,** retired.

William Bryant, extra gang foreman on the Canadian National, has been promoted to roadmaster on the Edson division, with headquarters at Coalspur, Alta., to succeed **L. Olson,** who has been transferred to the Edmonton division.

J. C. Hill has been appointed roadmaster on the San Antonio division of the Missouri-Kansas-Texas, with headquarters at San Antonio, Tex., to succeed **E. E. Turner,** who has retired after 38 years' service with that company.

J. M. Nelson, assistant supervisor on the Rutland, with headquarters at Burlington, Vt., has been promoted to supervisor of Subdivision No. 4, with headquarters at Bennington, Vt., succeeding **W. Unwin,** who has been transferred to Subdivision No. 3, with headquarters at Malone, N. Y., to replace **L. L. Wiggins,** whose promotion to office and valuation engineer is noted elsewhere in these columns.

Q. Baker, assistant engineer on the St. Louis-San Francisco at Sapulpa, Okla., has been promoted to roadmaster at that place to succeed **Walter Marsh,** who has been transferred to the Kansas division at Neodesha, Kan., where he takes the place of **R. Holland,** who has retired. **R. K. Stoneberger,** acting roadmaster at Kansas City, Mo., has been promoted to roadmaster with headquarters at Fayetteville, Ark.

C. F. Longerbeam, general foreman of construction on the Amarillo-Liberal line of the Chicago, Rock Island & Pacific, with headquarters at Stinnett, Tex., has been promoted to roadmaster at Dalhart, Tex., with territory extending from Texhoma, Okla., to Tucumcari, N. Mex., succeeding **C. B. Lane,** who has been retired on a pension. Mr. Longerbeam was born on March 11, 1887, at Downey, Iowa, and was educated at the State University of Iowa. He entered the employ of the Rock Island on August 15, 1910, as a building inspector at Little Rock, Ark., and after holding several minor positions in the engineering department, he was promoted successively to assistant engineer, resident engineer and general foreman of construction on the Amarillo-Liberal line of the Rock Island. He was holding the last-named position at the time of his recent promotion to roadmaster.

Mr. Lane was born in the state of New York and entered railway service in 1876 as an office boy on the Wabash at Lafayette, Ind., later serving in clerical capacities on various other roads until January 1, 1887, when he entered the service of the Rock Island on construction work at Topeka, Kan., later being engaged in construction work in Oklahoma. He was afterwards appointed agent at McPherson, Kan., and after serving five months in that capacity he was engaged in construction work between South Omaha, Neb., and Lincoln, later returning to clerical duties at Colorado Springs, Colo. In 1893 Mr. Lane was promoted to roadmaster at Phillipsburg, Kan., and ten years later was transferred to Dalhart, where he was located at the time of his recent retirement.

Changes on the Pennsylvania

F. S. Bowden, assistant on engineer corps on the Pittsburgh division of the Pennsylvania, has been promoted to assistant supervisor on the Renovo division to succeed **M. C. Bitner,** who has been transferred to the Panhandle division to take the place of **F. W. Kittleberger,** who has been promoted to supervisor on the Renovo division, with headquarters at Warren, Pa., to succeed **J. D. Archibald,** resigned. **E. K. Jackson,** assistant on engineer corps on the Wheeling division, has been promoted to assistant supervisor on the E. & A. division at Niles, Ohio. **F. W. Artois,** assistant supervisor on the Monogahela division, has been transferred to the Allegheny division to replace **W. P. Geiser,** who has been transferred to the Panhandle division to succeed **C. K. Kuszmaul,** who has been promoted to supervisor on the Renovo division, with headquarters at Erie, Pa., succeeding **D. B. Cellar,** who has been appointed chief draftsman on the Panhandle division. **J. C. Buzard,** assistant on engineer corps on the Allegheny division, has been promoted to assistant supervisor on the Panhandle division to succeed **L. C. Martoia,** who has been promoted to supervisor on the Allegheny division, with headquarters at Kittanning, Pa., to take the place of **C. H. Frick,** who has been transferred to the Pittsburgh division at Derry, Pa., to succeed **F. L. Shea,** who has been transferred to the office of the chief engineer maintenance of way of the Central region at Pittsburgh. **H. J. Kerstetter,** master carpenter on the Buffalo division, with headquarters at Olean, N. Y., has been appointed supervisor on the same division, with headquarters at East Aurora, N. Y., succeeding **R. D. Burns,** who has been transferred to the Panhandle division at Steubenville, Ohio, to succeed **W. W. Patchell,** who has been promoted to division engineer on the Eastern division.

L. C. Thornhill, assistant on engineer corps on the Pennsylvania, with headquarters at West Philadelphia, Pa., has been promoted to assistant supervisor at Williamsport, Pa., succeeding **J. E. Schwab,** who has been transferred to North Philadelphia, to succeed **R. M. Herbert,** who has been transferred to Washington, D. C., to replace **G. H. Ricedorf,** who has been promoted to supervisor at Media, Pa. **B. C. Wagner,** assistant supervisor at New Brunswick, N. J., has been promoted to supervisor at Columbia, Pa., where he succeeds **R. S. Dunkle,** who has been transferred to South Philadelphia, to succeed **J. O. Heap,** who has been assigned to special duty on the Baltimore division. **L. R. Bailey,** assistant supervisor at Perryville, Md., has been transferred to the Baltimore division, succeeding **H. A. Holzer,** who has been transferred to South Philadelphia. **G. M. Hain,** assistant on engineer corps at Downington, Pa., has been promoted to assistant supervisor at Harrington, Del., to replace **C. R. Bergman,** who has been transferred to Camden, N. J., to succeed **G. A. Williams,** who has been transferred to Chester, Pa., to succeed **B. W. Tyler, Jr.** Mr. Tyler has been transferred to Tyrone, Pa., where he succeeds **P. E. Feucht,** who has been promoted to supervisor with headquarters at Norristown, Pa., succeeding **E. L. Hunter,** who was transferred to Huntingdon, Pa., to succeed **J. D. Lovell,** who has been promoted to supervisor in the office of the assistant to general manager, at Philadelphia. **D. H. Mehl,** assistant supervisor at Lemoyne, Pa., has been promoted to supervisor at Millville, N. J., to succeed **E. L. McNeal,** who has been transferred to Millersburg, Pa., where he will succeed **A. W. Preston, Jr.,** who has been transferred to Washington, D. C. **Wm. Easterbrook, Jr.,** assistant on engineer corps at Huntingdon, Pa., has been promoted to assistant supervisor at Pottsville, Pa., to succeed **J. T. Honker,** who has been transferred to Hollidaysburg, Pa., succeeding **P. W. Triplett,** assistant supervisor, who has been transferred to Lemoyne, Pa., where he succeeds Mr. Mehl.

Purchasing and Stores

J. J. McDonald, chief inspector of fuel, ties and timber of the Chicago, St. Paul, Minneapolis & Omaha, with headquarters at St. Paul, Minn., retired under the pension rules of that company on February 1.

Robert H. Adams, assistant purchasing agent of the Los Angeles & Salt Lake, with headquarters at Los Angeles, Cal., has been promoted to purchasing agent, with headquarters in the same city, to succeed **N. H. Foster,** deceased.

Bridge and Building

R. E. Egolf, assistant master carpenter on the Pittsburgh division of the Pennsylvania, has been promoted to master carpenter on the Buffalo division, with headquarters at Olean, N. Y., to succeed **H. J. Kerstetter,** whose appointment as supervisor of track on the same division is noted elsewhere in this issue.

Byron Cross, assistant general foreman of bridges and buildings on the Atchison, Topeka & Santa Fe at Arkansas City, Kan., has retired under the pension rules of that road, after more than 51 years' continuous service.

Obituary

Henry Kleine, assistant general roadmaster of the Chicago & Alton, with headquarters at Slater, Mo., died on February 17 at his home in Slater, Mo.

Robert Lee Baugh, former purchasing agent of the Central of Georgia, died at the home of his son in Memphis, Tenn., on February 5, at the age of 80 years.

Luther D. Burdette, supervisor of track on the Chesapeake & Ohio, with headquarters at Richmond, Va., died in Memorial hospital in that city on December 21, 1928, at the age of 37 years.

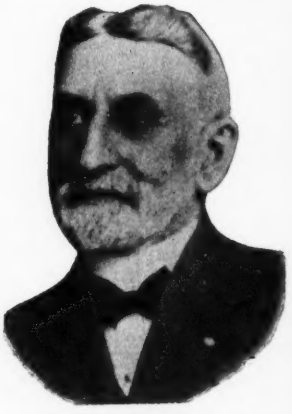
Robert W. Sands, roadmaster on the Los Angeles & Salt Lake unit of the Union Pacific system, with headquarters at Los Angeles, Cal., died in that city on January 30, after an illness extending over several months.

C. E. Redmond, formerly bridge and building supervisor on the Missouri Pacific with headquarters at Aurora, Mo., died on December 20, 1928, in a hospital at Nevada, Mo., after a prolonged illness. Mr. Redmond retired about a year ago on account of failing health, after more than 25 years' service with the Missouri Pacific.

F. R. Stevens, office and valuation engineer of the Rutland, with headquarters at Rutland, Vt., died at his home in that city on January 20, from spinal meningitis. Mr. Stevens entered the service of the Rutland in 1919, holding various positions until November, 1927, when he was promoted to office and valuation engineer, which position he was holding at the time of his death.

Fayette S. Curtis, president of the Old Colony (leased to the New York, New Haven & Hartford), who was formerly chief engineer and later vice-president of the New Haven, died recently at his home in Boston, Mass. Mr. Curtis was born on December 16, 1843, at Oswego, N. Y., and entered railway service as a civil engineer with the Albany & Susquehanna (now a part of the Delaware & Hudson), later serving as an assistant engineer on several other roads. In 1874, he was appointed chief engineer of the New York & Harlem (now a part of the New York Central) and two years later was appointed chief engineer of the New Haven. He was elected a vice-president of the New Haven in 1900, resigning from that position in 1907. He was subsequently elected president of the Old Colony, which position he was holding at the time of his death. He was also chairman of the board of trustees of the Boston Terminal Commission and president of the Union Freight Railroad at Boston.

Joseph H. Waterman, former superintendent of timber preservation of the Chicago, Burlington & Quincy, with headquarters at Galesburg, Ill., died at his home in that city on February 5. Mr. Waterman at the time of his retirement on September 1, 1927, under the pension rules of the company, had been in railway service for 47 years, during all of which time he was connected with the Burlington. He entered railway service on July 1, 1880, as a trucker at the Burlington transfer station at Plattsmouth, Neb., and was promoted successively to foreman of the lumber yard of the stores department at Plattsmouth, foreman of the maintenance material yard at Lincoln, Neb., storekeeper at Lincoln and



Joseph H. Waterman

assistant general storekeeper of the lines west of the Missouri river at Omaha, Neb. On May 1, 1910, he was further promoted to superintendent of timber preservation, with headquarters at Galesburg, which position he was holding at the time of his retirement from railway service. In January, 1928, Mr. Waterman was appointed special agent for the Curtin-Howe Corporation, New York, and was holding that position at the time of his death. He was president of the American Railway Storekeepers' Association in 1910-1911 and was first vice-president of the American Wood-Preservers' Association in 1913, and president of that organization in 1915. In June, 1928, he was awarded a life membership in Division VI—Purchases and Stores of the American Railway Association.

The Denver Land Company, representing a group of taxpayers in the Moffat tunnel assessment district, has filed an appeal with the Colorado Supreme Court from the decision of a district court which sustained the validity of the $8,750,000 of supplemental bonds issued by the Tunnel Commission for construction.

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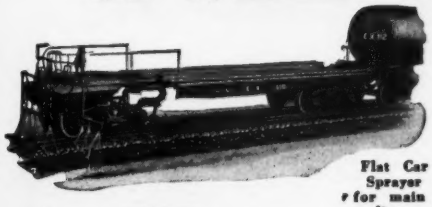

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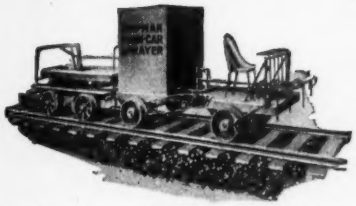

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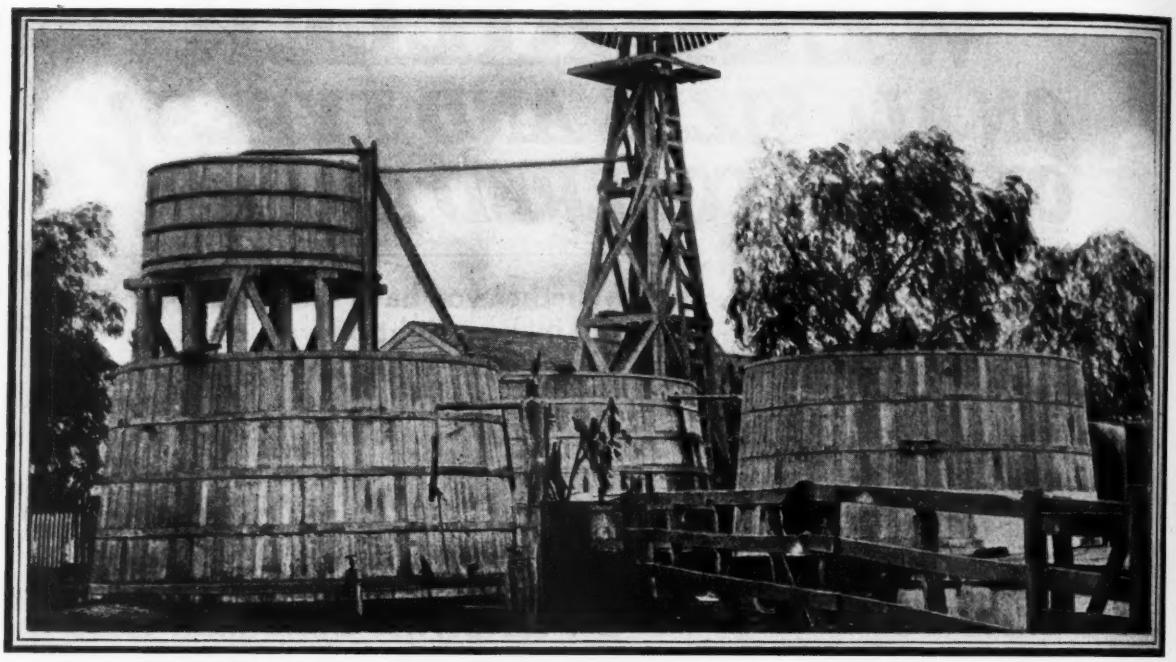

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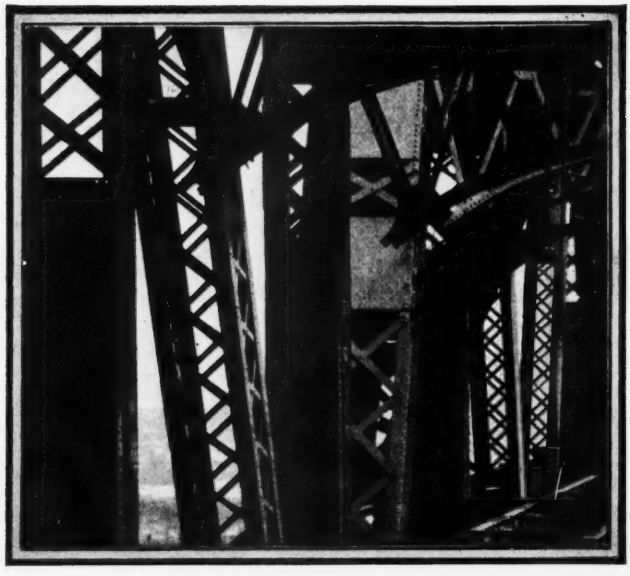

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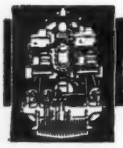

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6. The Vertical Curve.
7. Economics of Curves.
8. Essential Elements in the Design of Switch Connections.
9. Rules for Computing Switch Dimensions.
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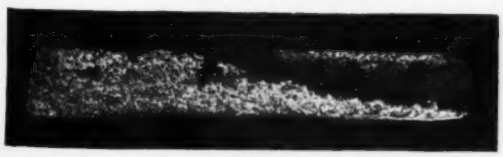

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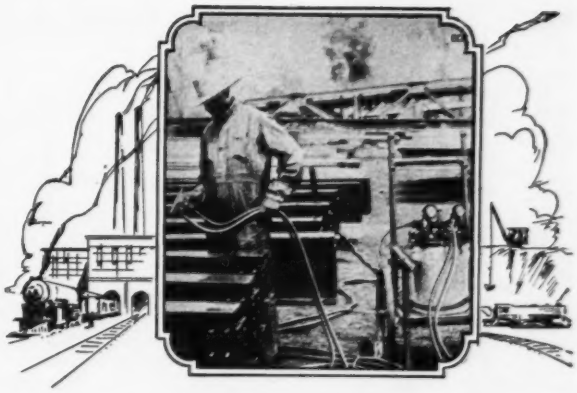

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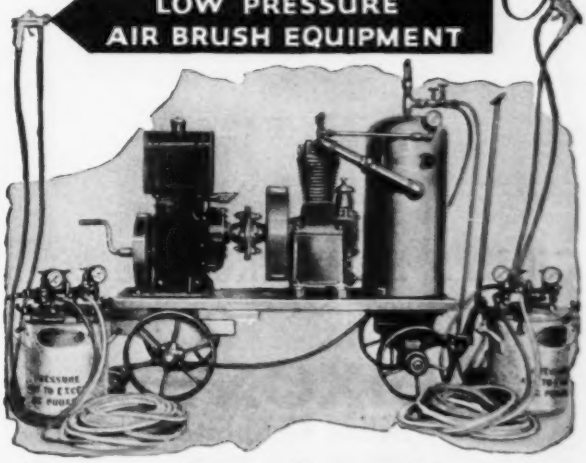

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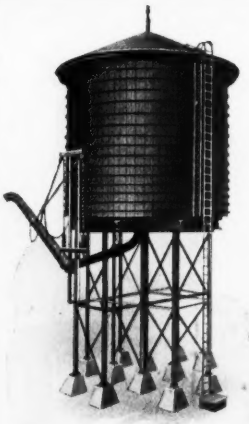

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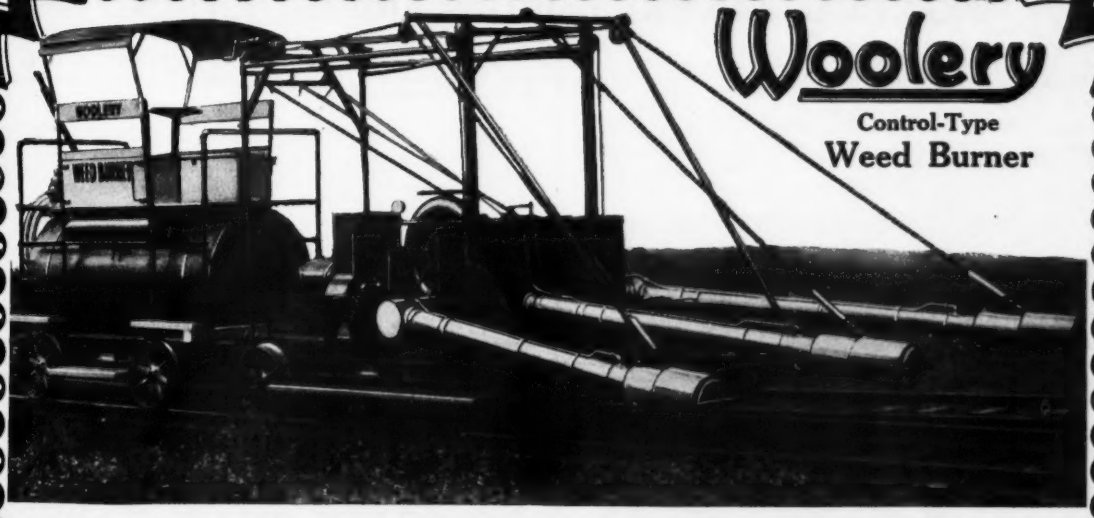

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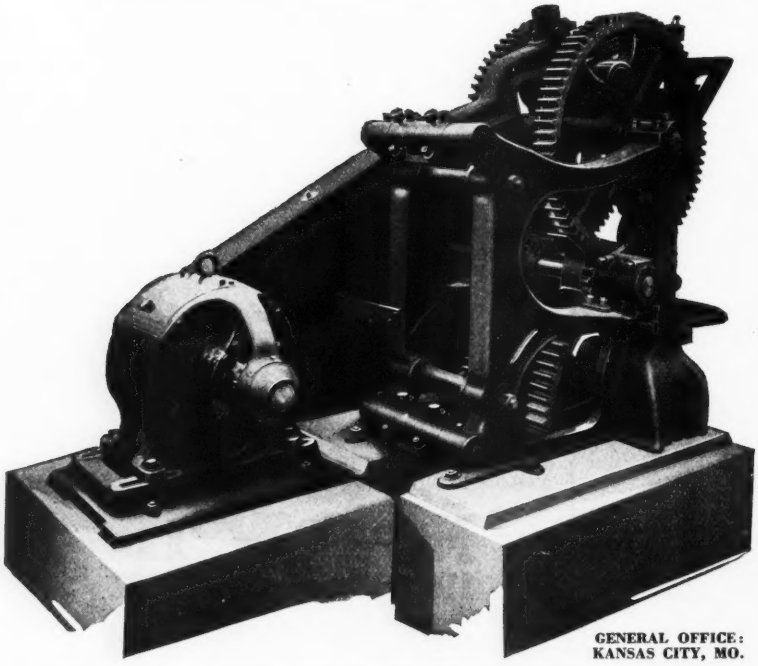

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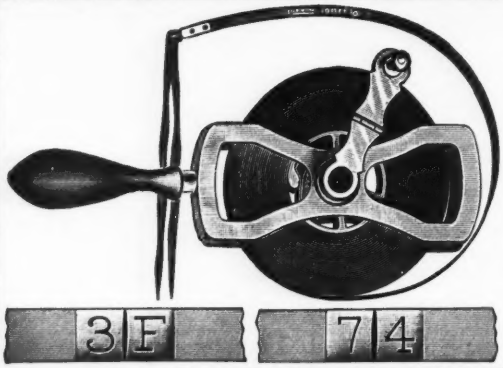

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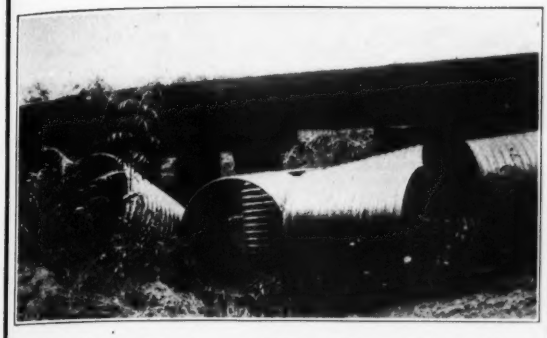

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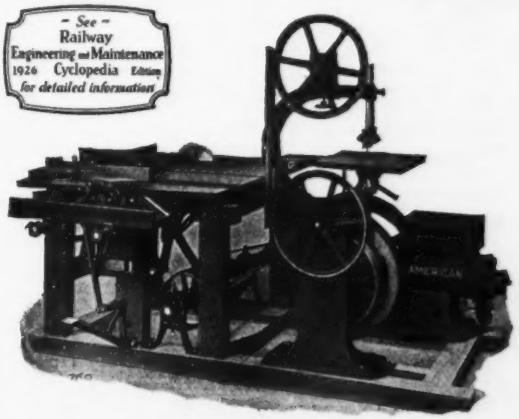

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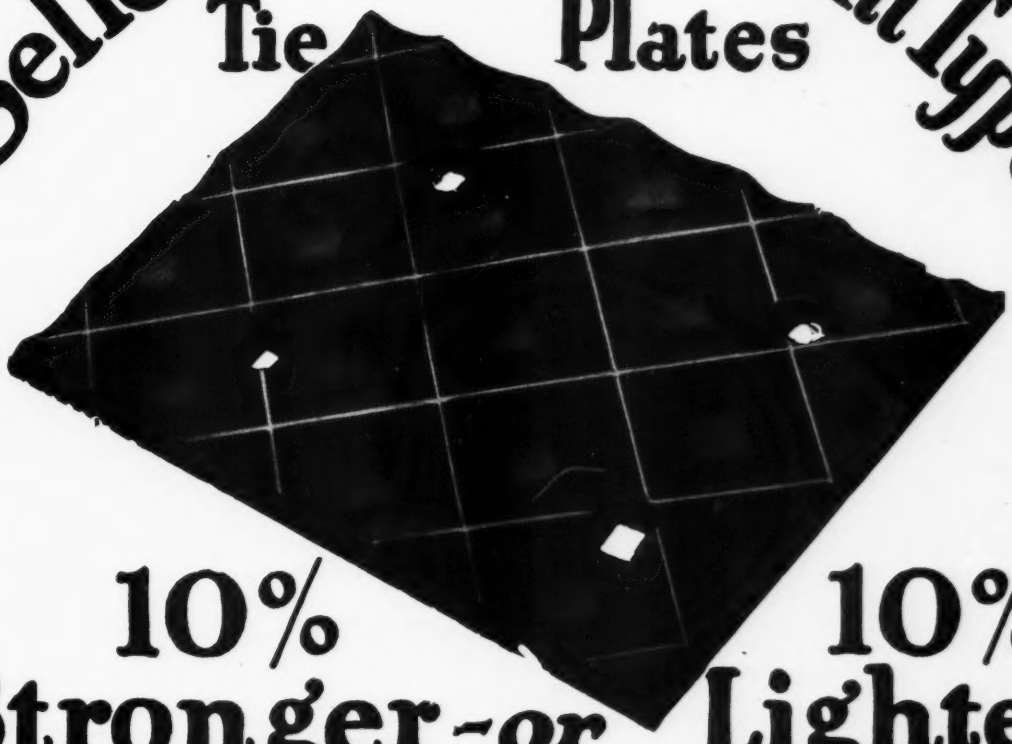

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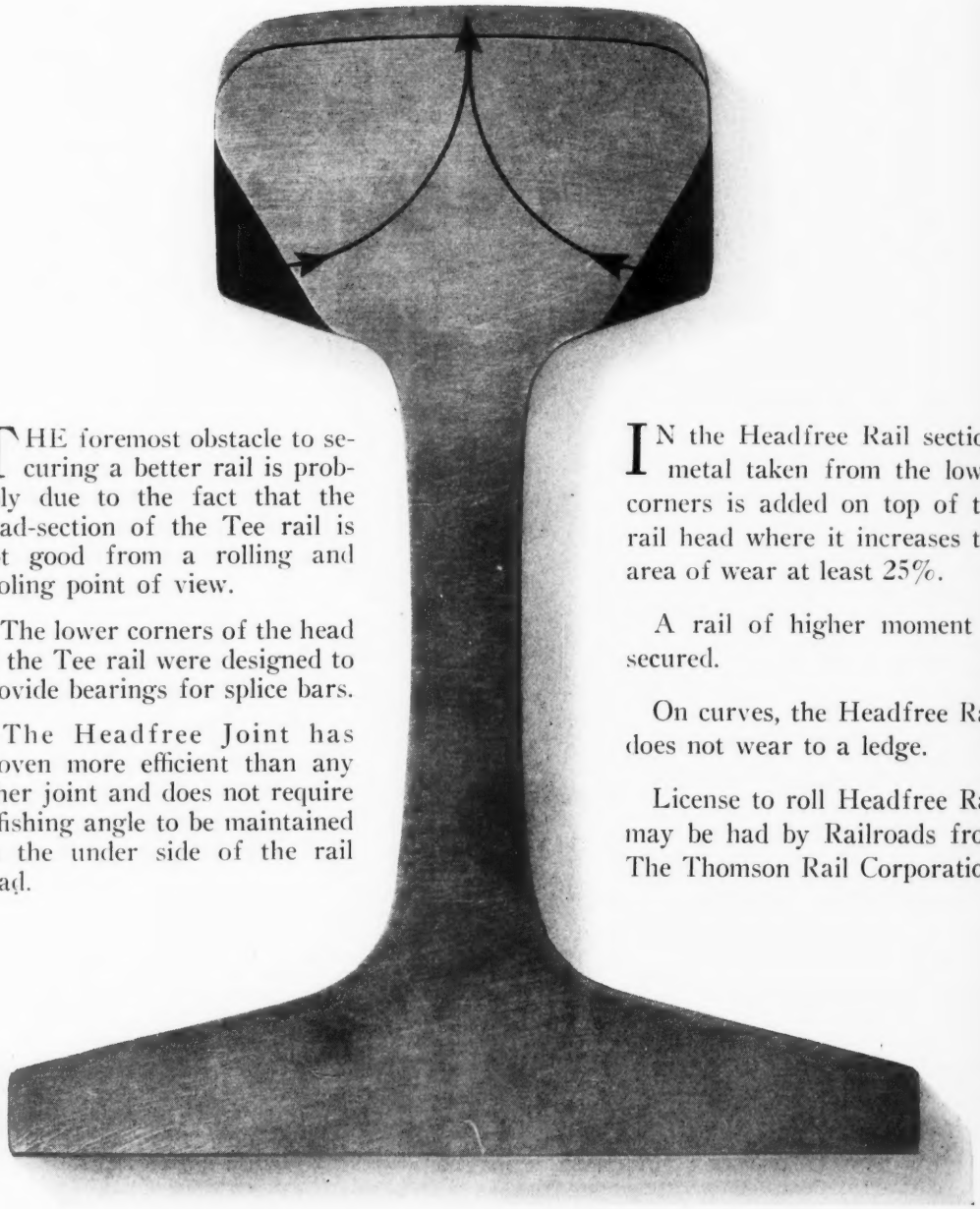

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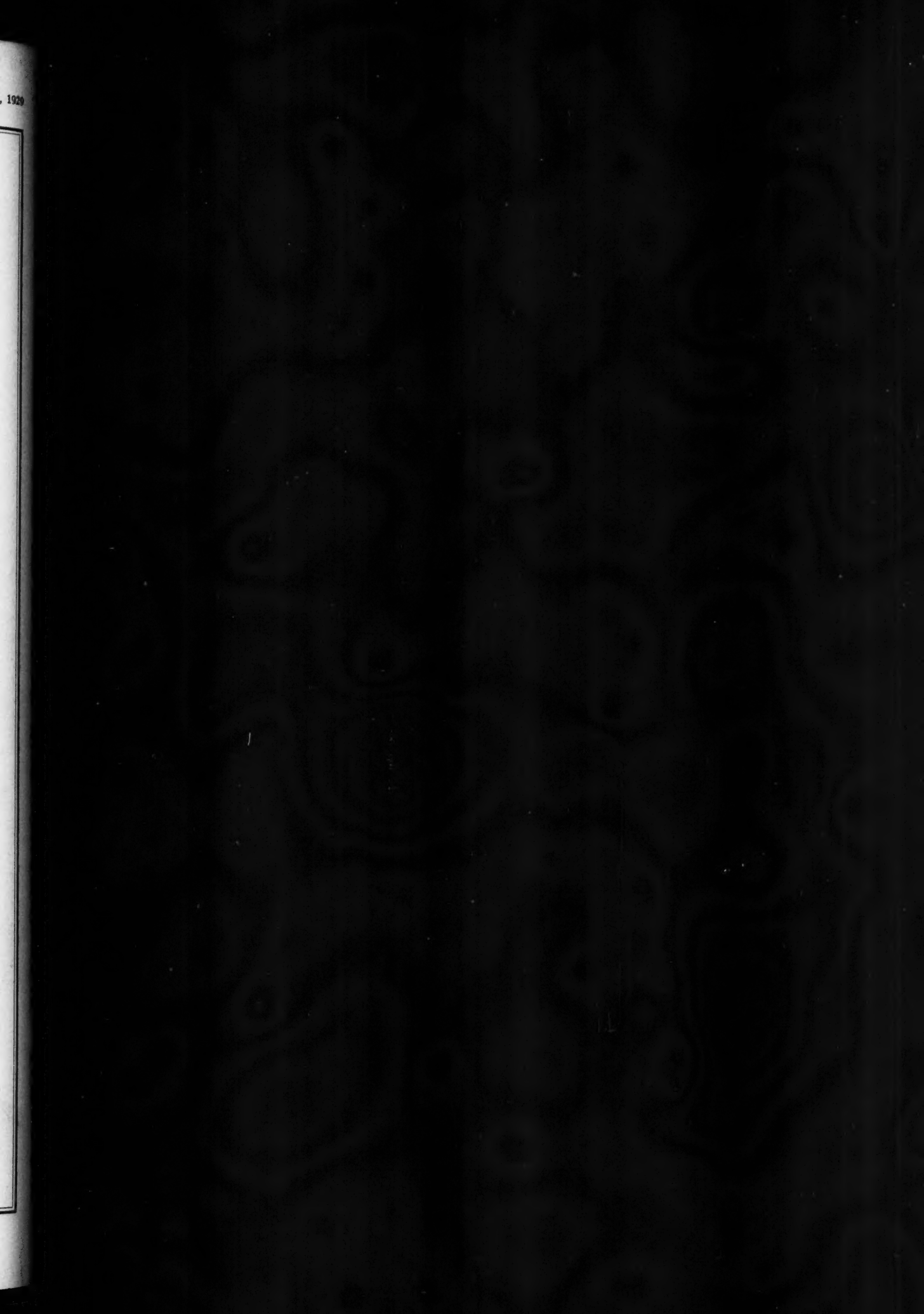
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